

**Reviewing the Effects of Poverty and Food Scarcity on the Prevalence of Type II Diabetes
Mellitus in the Metro Atlanta Area**

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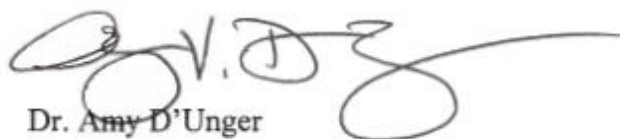
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Reviewing the Effects of Poverty and Food Scarcity on the Prevalence of Type II Diabetes Mellitus in the Metro Atlanta Area

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ABSTRACT

Type II diabetes is a medical condition that is prominent in both society and medical research. In the metro Atlanta region, over nine percent of the population has contracted the disease. It is not a random disorder but the result of individual factors and local environments. One of the most influential factors is diet, which is directly impacted by what foods are available locally. Healthy food acquisition can be almost impossible in food deserts, or areas of the country that contain either no or extremely limited locations to purchase healthy food. These deserts litter the metropolitan area of Atlanta, and are often intermixed inside more rural or low-income areas. This paper identifies these Atlanta food deserts and analyzes them for a correlation to the prevalence of type II diabetes. The data confirmed my hypothesis that there were correlations between these clearly identifiable sites in greater Atlanta and elevated levels of incidence of type II diabetes. Clayton and DeKalb counties had the largest proportions of their populations inside food deserts at 45.1% and 21.8% respectively, and had increased percentages of their population with type II diabetes: Clayton County surveyed with 10.6% of its population having the disorder, and 8.9% of DeKalb's inhabitants had acquired the disease at some point. The data suggest that food deserts have adversely affected the health of thousands of people. On the other hand, there are sectors that can be targeted and changed to directly increase the quality of living for over 17% of the metro Atlanta populace that are currently living inside of them.

INTRODUCTION

When studying issues like health and disease, researchers often carry out their work relying on complex and specialized medical knowledge they possess. While this can allow them to approach specific problems others may not, it can also create situations where they focus so much on one aspect of the subject that they begin to disregard other potential explanations and causes. Deciding to narrow the scope of research to strictly the biological causes of diseases can often lead to scientists overlooking or discounting the other factors that may stem from different fields of study. There can be a number of influences from various areas that are vital to understanding how a disease may gain prominence. Approaching these matters using an interdisciplinary approach, and combining biological knowledge with social sciences can help researchers better understand all of the vital components.

This is particularly true with diseases like type II diabetes mellitus, which largely develops as a result of dietary choices and exercise regimens that people have. Even this though has complications to it. Sometimes it is purely a matter of choice and personal decision. Many times however, the individuals find themselves in environments that are uncondusive to their health, and are severely lacking in the necessary resources to allow them to live healthy lives. One example of this is the prevalence of type II diabetes in the metro Atlanta area. The region has both elevated incidences of the diseases as well as large quantities of areas known as food deserts, which are zones devoid of almost any healthy dining option for the residents inside it. Governmental and private research has found that these food deserts can lead to a decrease in the general wellbeing of the residents and to an increase in the levels of disease. When you begin to analyze the varying levels of diabetes inside the Atlanta area, and combine it with an examination of the quantity and composition of food deserts inside the different regions, there

will likely be observable trends that show correlations between the condition and the environment.

PURPOSE

The goal of this paper is to evaluate the effects that food deserts and the lack of dietary options in Atlanta have had on the incidence and prevalence of type II diabetes in the metro Atlanta area. I hypothesize that these social and economic elements, as part of the bigger picture of poverty and the lack of fresh food sources, are a major factor in shaping the continual acquisition of type II diabetes by the inhabitants of Atlanta. While it may not be the goal of businesses like grocery stores or restaurants to cause their “ignored” customers to develop life altering health problems, it is a result. These poorer populations do not have the resources or ability to live outside of the communities that they currently reside in, and are being inadvertently “punished” because of it. It is an inequality that is largely ignored because it is difficult to target accurately, and can often times have racial attributes to it that can possess political elements. People who are suffering from something cannot protest or try to find a solution if they do not know that the problem exists.

Food deserts are defined by the U.S. Department of Agriculture as:

Urban neighborhoods and rural towns without ready access to fresh, healthy, and affordable food. Instead of supermarkets and grocery stores, these communities may have no food access or are served only by fast food restaurants and convenience stores that offer few healthy, affordable food options. The lack of access contributes to a poor diet

and can lead to higher levels of obesity and other diet-related diseases, such as diabetes and heart disease.¹

The paper is an effort to analyze a wide variety of possible sources of the problem, but also to understand the elements that may be altering the disease and how they are linked to locations. The research will ideally detect not only the scientific but also the social and economic factors of poverty that play into the potential prominence of the disease in the region. It will study poverty-related components and create a modern diagnosis of the causes of diabetes. This study has the potential to help target diabetic causes on a larger scale. It can determine the socioeconomic factors that are perpetuating it and offer insight on how to reduce their prominence, in turn potentially slowing the occurrences and reducing the effects of diabetes.

BACKGROUND & LITERATURE REVIEW

ENDOCRINE SYSTEM

The endocrine system is a network of glands that spans the majority of the body and includes the adrenal glands, the ovaries, the testes, the pancreas, and the thyroid gland. The hormones it produces can affect the functionality of the body, including the processes of reproduction, stress response, energy, growth, strength, and development of the sex organs.² Critically, it maintains the balance between different systems inside the body. Sometimes this internal balance becomes upset, and the body's operations begin to break down. Endocrine diseases arise from disorders within a body's endocrine system. These disorders can affect the body in a number of ways, from altering involuntary actions to creating long-term issues such as

¹ "Food Deserts." USDA.gov. 20 February 2015. <http://apps.ams.usda.gov/fooddeserts/fooddeserts.aspx>

² Feuer, Molly. An Introduction to the Endocrine System. Hormone Health Network. May 2013.

short stature, hyper- or hypothyroidism and precocious sexual development. One of the most common problems, type II diabetes, can appear due to biological inadequacies in the body.

TYPE II DIABETES

Type II diabetes is not created in the same fashion as its associated disease, type I diabetes. Type I diabetes is primarily acquired before the patient is an adult and accounts for only about 5% of diabetes cases.³ This form of diabetes is associated much more closely with a person's genetic structure and the viruses to which they have been exposed in the past.⁴ In this case, the person's pancreas ceases to produce any amount of insulin. The immune system, which is intended to fight off foreign materials in the body, instead mistakenly targets the sources of insulin, and rids the body of any trace of them.

The other form of diabetes, type II, is a little different from the first. It can be acquired at any point in life. It also does not affect the body in the same way. The pancreas is not directly targeted, and the production of insulin is not halted. Instead, the body begins to either form a sort of resistance to the insulin it possesses, or it cannot create enough to adequately handle the amount of glucose that is inside a person's bloodstream. If it is left untreated, it can lead to a number of problems. For example, a person can develop heart issues, nerve damage known as neuropathy, kidney damage known as nephropathy, and blurriness or blindness in the eyes. If too much glucose builds up in the blood stream it can cause lasting damage and even lead to amputations.⁵

³ *Type I Diabetes*. American Diabetes Association.

⁴ Mayo Clinic Staff. *Type 1 diabetes: Basic*. Mayo Clinic. 2 August 2014.

⁵ Mayo Clinic Staff. *Type 2 diabetes: Complications*. Mayo Clinic. 24 July 2014.

The formation of the second type of diabetes is much less reliant on genetic factors than the first type. It is true that some genetic differences do seem to have an effect on whether or not an individual will develop type II diabetes. Native Americans and African Americans are two ethnic groups who are consistently diagnosed with the disease at a higher frequency.⁶ However, it can be difficult to discern if this is because of the genes that the groups have, or if it is the environments in which they live. Type II diabetes is an acquired disease, and the individual's actions and behaviors can lead to the disease forming.

One of the rising trends that has recently garnered increased attention is the relationship between poverty and the disease. Unlike poverty in the majority of the world, poorer citizens of the United States live a life that is in stark contrast to that of their foreign counterparts. Instead of working laborious jobs that require extra physical exertion, they work in more service-related careers where the physical components are monotonous and lack the benefits that the other group may receive from their arduous activities. Their bodies undertake much less exertion and exercise. Instead of sustaining themselves off of locally grown and collected food, they have to purchase meals and snacks that are processed and packaged. They are full of additives and preservatives that are known to cause type II diabetes. They either do not have the money to purchase healthier food, or because of their community and its potential lack of healthy and available options, do have access to stores with healthy options.

ACADEMIC RESEARCH

Most research focuses on the biological causes and effects of type II diabetes and the ways that the disease can cause death, such as Matthew Magee's work on how diabetes can turn

⁶ Cho, Pyone et al. "Diabetes-related mortality among American Indians and Alaska natives, 1990-2009." *American Journal of Public Health*, 104 (June 1, 2014).

manageable diseases deadly.⁷ There are numerous attempts to try to research a way to reverse the condition or find a “cure.” Others try to see if there are specific biological or external factors that may increase the risk of acquiring the disorder. In this type of research, genetic structures and inherent characteristics are primarily the focus; occasionally more factors will be included, like an individual’s BMI, blood pressure, and fasting glucose levels.⁸ Less frequently, researchers attempt to delve into the diets and nutritional regimens of those with diabetes and the effects that the differences cause; one of the most interesting of these was Donliang Ge’s study upon the differences amongst twins.⁹ Most research focuses on genetics and physiology, focusing more on the biological foundations of diabetes and less on the sociological explanations of its dispersion. In an attempt to try to solve the problem directly at the source, they sometimes risk losing sight of a way to determine and evaluate what is perpetuating the disease in society.

There are social and economic forces that are spawning and perpetuating diabetes. These two work in tandem to alter the prevalence of diabetes from one location to another. Diet is the main outside factor that is studied, but it is almost always put forth on its own, as if it exists in a vacuum, unaffected by anything, despite the many things that can change and create an individual’s diet. Social positions and class can give people access to different resources; income and general economic means dictate what nourishment people can and cannot purchase. People in different classes rarely have the same diet or quantity and quality of food. For people with less

⁷ Magee, M., Foote, M., Maggio, D., Howards, P., Narayan, K., Blumberg, H., & Kempker, R. “Diabetes mellitus and risk of all-cause mortality among patients with tuberculosis in the state of Georgia, 2009-2012.” *Annals Of Epidemiology*, 24-5 (2014).

⁸ González-Villalpando, C. et al. “Risk factors associated to diabetes in Mexican population and phenotype of the individuals who will convert to diabetes.” *Salud Pública De México*, 56-4 (2014): 317.

⁹ Ge, D., Dong, Y., Wang, X., Treiber, F., & Snieder, H. “The Georgia cardiovascular twin study: influence of genetic predisposition and chronic stress on risk for cardiovascular disease and type 2 diabetes.” *Twin Research And Human Genetics: The Official Journal Of The International Society For Twin Studies*, 9-6 (2006): 965.

money, choosing where to allocate money can become more difficult. They have to make tougher choices on what to buy with their limited funds. These restrictions may lead to certain kinds of prioritization, and healthy foods and nutritious alternatives may not become the paramount concern when other things such as housing and medical needs come into the picture.

These medical requirements are often a big focus of the literature. Diabetic citizens have to frequent endocrinologist doctors much more often than most people would see a general practitioner, and have to regularly perform self-evaluations of their symptoms.¹⁰ They have to carefully monitor their health status or risk complications. They are constantly in a state of self-scrutiny and potential danger, having to transport different forms of insulin on their bodies in case of emergencies. Chet Galaska draws strong comparisons to their entire life becoming a tight-rope act, with them having to constantly balance their internal mechanisms through external actions.¹¹ According to the American Diabetes Association, type II diabetes has cost \$245 billion on research and treatment in 2012 alone. Much of this number is attributed to diabetics having to persistently purchase drugs and medical supplies just to eat and survive, creating an expensive disease to live with, and one that many poor Atlanta families do not have adequate enough insurance to treat.¹²

Even diabetics who do have health care and access to medical supplies do not always have equal opportunities to their peers. The quality of treatment and the availability of supplies are not standardized. Patients cannot always control the level of expertise that their “experts” have. Other times poorer people cannot get a subsidy for the medicine they need. One report in

¹⁰ Sadur, C., Moline, N., Javorski, W., et al. “Diabetes management in a Health Maintenance Organization: efficacy of care management using cluster visits.” *Diabetes Care*, 22-12 (December 1999): 2011.

¹¹ Galaska, Chet. *The Diabetes Book: What Everyone Should Know*. Longmeadow: Triad Press, 2014.

¹² *The Cost of Diabetes*. American Diabetes Association. 18 April 2014.

California showed that diabetics who lived in low-income areas were up to ten times more likely to have an appendage amputated than those who lived in a different area of the same state.¹³ The poorer diabetics cannot partake in every part of their treatment that is recommended and complications like amputations frequently arise.

Type II diabetes disproportionately impacts children living in poverty. Children who live with a single parent visit the doctor less often than a child living with both parents.¹⁴ Single-parent households are much more common in lower-income areas. Other times parents simply do not have the desire; low-level areas experience higher levels of unemployment, which is shown to increase the chances of child abuse and disregard.¹⁵ These factors lead to an increase in the likelihood of inadequate care for diabetic children, or those on the cusp of the disease.

Different communities can also consist of different groups of people. They can promote or idealize certain foods, and have others encourage certain diets or foods over others, which may or may not be more likely to lead to diabetic disorders. Likewise, advertising and media can have the same effect on a larger scale. Corporations and businesses with larger presences can try to persuade people to follow eating patterns that may end in negative results. Fast food companies flood the market with catchy slogans that glamorize their meals. “Have it your way” and “five-dollar foot long” are phrases that are sprawled across copious surfaces. “Think outside the bun” is repeated every twenty minutes in different languages on television stations. Neon signs light up the night sky as you drive down the roads. These catchy advertisements are

¹³ Brown, Eryn. “CALIFORNIA; with diabetes, poverty raises risks; low-income patients are more likely to undergo amputation of a lower limb.” *Los Angeles Times*, August 5, 2014, AA3.

¹⁴ Kaufman, F. “Association between diabetes control and visits to a multidisciplinary pediatric diabetes clinic.” *Pediatrics*, 103-5 (May 1999): 948.

¹⁵ Gillham, B., Tanner, G., Cheyne, B., Freeman, I., Rooney, M., & Lambie, A. “Unemployment rates, single parent density, and indices of child poverty: Their relationship to different categories of child abuse and neglect.” *Child Abuse & Neglect*, 22-2 (February 1998): 79.

constantly bombarding the areas with promises of pleasure, if only the viewers will visit their establishments. The fast food industry can even mislead the population into believing invalid facts about their health choices.

In the United States, members of minority groups are disproportionately likely to live in poverty. The varying components of their environment can begin to work in tandem to elevate the rates at which the disease appears. They can find their communities lacking the resources that more affluent areas may have. Diets that consist of large amounts of fast food, coupled with a lack of physical exercise, can lead to an increased risk of contracting type II diabetes. As often seen, these factors are routinely more common in poor communities of color. Most of the individuals with type II diabetes are overweight, and cannot hit a level of exercise to maintain homeostasis. It continues to build into an almost autocatalytic cycle. It becomes harder and harder to exercise, and the excess continues to build up.

The literature shows that this problem can be found in people of all ages, and that problems like the inability to access green space for healthy activity and exercise can begin to negatively impact the population at a younger age and set them up for a lifestyle that may be difficult to alter. Something as mundane as access and proximity is often overlooked, although the impact of this has been disputed.¹⁶ These public commons are projects that could potentially be used to teach younger populations healthier lifestyles at an early age. But due to the poverty of certain areas, most notably the ones that would be in most need for the playsets, they cannot afford them.

¹⁶ Burdette, H. & Whitaker, R. "Neighborhood playgrounds, fast food restaurants, and crime: relationships to overweight in low-income preschool children." *Preventive Medicine*, 38 (January 1, 2004): 57.

Access to high-quality food is dependent on access to affordable transportation. Poor citizens in low-income areas in Atlanta often cannot afford to possess private means of transportation. The initial costs of automobiles, in combination with the continual upkeep and insurance bills, would take up too much of their annual earnings. Instead they use public transportation, which are in their very nature meant to serve the widest population possible; they are not targeting specific locations that may only be stops for a few people.¹⁷ Small organic markets or healthier shops, if they exist on the route, are most likely going to be for a very niche market. To get to them, the passengers would have to go out of their way and walk a significant distance. Their only reward would be a healthier meal. To many, the payoff would not be worth the expenditure.

These geographic locations may have more of an impact than is usually noted; they affect everything from food supply lines to marketing campaigns. Whatever farmland may have existed at one point in the city has become replaced with commercial buildings and housing complexes. Food has to be imported from outside locations. Certain types of food may exist in varying levels of freshness and quality based on how far away the home is from the source. Atlanta has become a sprawling metropolis. The city itself has been around for almost two hundred years, and while parts of it were razed during the Civil War, it has grown outward over time. Sections and institutions were tacked on as Atlanta rebuilt. City planning can potentially help new establishments and renovations decrease the disparity gaps, and as a result decrease food deserts.¹⁸ But this solution is not as effective in practice as it is in theory. The problem in Atlanta has become rampant and engrained. The lack of potential development space combined with the

¹⁷ Sanchez, Thomas W. "Poverty, policy, and public transportation." *Transportation Research: Part A: Policy and Practice*, 42-5 (June 2008): 833.

¹⁸ Lang, T & Caraher, M. "Access to healthy foods: part II. Food poverty and shopping deserts: what are the implications for health promotion policy and practice?" *Health Education Journal*, 57-3 (September 1998): 202.

already over populated residential areas creates a situation that cannot be solved with a few targeted market additions. You need the resources to be able to create supermarkets and distributors, but also the demand for their goods. Surveys have shown that some foods, like organically grown produce, are purchased by relatively low numbers of people.¹⁹ If the business cannot sustain revenue or if the location drives away potential customers, no one is going to establish a business in that site.

These “food deserts,” as they are called, have only recently begun to garner national scholarly attention. Some continue to express apprehension at their existence, although the USDA states that they have quickly become a focus that they are trying to eradicate. Food deserts are tangible locations to the USDA, and ones that are severely lacking healthy or reasonable choices. These areas are prevalent in cities with low-income neighborhoods. Food deserts emerge because of several different longitudinal factors such as migration, economic collapse and turmoil, and suburbanization of areas outside cities.²⁰

Scholars debated whether food deserts and their altered prices and availability levels severely impact the consumption of healthier foods.²¹ Some researchers suggest that gender and age have a much bigger impact on the way people decide to consume items like vegetables than their socioeconomic status.²² The majority of the scholarship on food deserts demonstrates a

¹⁹ Tregear, A., Dent, J., & McGregor, M. "The demand for organically grown produce". *British Food Journal*, 96-4 (1994): 21.

²⁰ Larsen, Kristian, and Jason Gilliland. "Mapping the evolution of 'food deserts' in a Canadian city: supermarket accessibility in London, Ontario, 1961-2005." *International Journal Of Health Geographics* , 7 (January 2008): 1.

²¹ Morton, Lois Wright & Blanchard, Troy. “Starved for access: life in rural America’s food deserts.” *Rural Sociological Society*, 1-4 (2007): 1.
Wrigley, Neil. "Food Deserts' in British Cities: Policy Context and Research Priorities." *Urban Studies (Routledge)* 39, no. 11 (October 2002): 2029.

²² Pearson, T., Russell, J., Campbell, M., & Barker, M. “Do 'food deserts' influence fruit and vegetable consumption?--A cross-sectional study.” *Appetite*, 45-2 (October 2005): 195.
Raja, Samina, Changxing Ma, and Pavan Yadav. "Beyond food deserts: measuring and mapping

strong correlation between their existence, residents living in poverty, and adverse health outcomes. The current research seeks to apply this scholarship using a case study of Atlanta, demonstrating how low-income citizens are being subjected to inadvertent healthcare costs and medical problems that plague them almost solely because of an environment they are unable to escape

All of these proposed factors can be measured and analyzed. To most effectively do so, the examined area will be limited to Atlanta. This area is a statistical hotbed for the disorder, with instances occurring much more frequently than in most of the country. The focus on the region will not only provide a clear separation between the rest of the nation, but also to create a core data set that can be examined with a larger group, the entirety of the United States, if needed. Statistics on diabetic occurrences in the region can be compared to economic data taken from the U.S. Census Bureau and other sources. There are a myriad of possible overlooked causes that could, in a less perceivable way, lead to increases in reported cases of diabetes. After I analyze my findings, I will link these impacts of poverty in the area with the incidence of type II diabetes in Atlanta. The discovered links between these origins and diabetes can be very beneficial to public health and the wellbeing of individuals. Unrecognized causes can be targeted and improved and can be combined with diabetic screenings and identification techniques that are currently in place by the government to try to increase preparation.²³

racial disparities in neighborhood food environments." *Journal Of Planning Education & Research*, 27-4 (Summer 2008): 469.

²³ Dall, T. et al. "Detecting type 2 diabetes and prediabetes among asymptomatic adults in the United States: Modeling American Diabetes Association versus US Preventive Services Task Force diabetes screening guidelines." *Population Health Metrics*, 12-12 (2014).

METHODS

PROCEDURES AND TECHNIQUES

The current research examines five counties that include and surround the city of Atlanta: Fulton, DeKalb, Cobb, Clayton, and Gwinnett. While they do vary in geographical size and populations, they are all large enough to be optimal choices. Large numbers of stores and restaurants also lie within their boundaries. The food suppliers were chosen in a similar manner. The largest grocery stores chains, superstores, and fast food restaurants in the Southeast were selected. The chosen businesses were compiled using lists with their total nationwide numbers and also by looking at which ones had the most branches in the area. While some stores may have numerous locations across the nation, if they have very few to none in the Atlanta area, then they were not used. The goal was to try to choose companies that would provide the most accurate representation of daily life and choices in the area.

The total amounts per category were compiled into both an overall regional and county specific averages. The actual locations and sizes of the specified food deserts I used were taken directly from a USDA database and locator tool. These charts were then compared to the maps that I created to line up which stores and restaurants the deserts contained. The amounts and averages of these areas were evaluated, and then compared to the averages to see the how they equated. Using county level diabetes prevalence statistics from the CDC, these numbers will be examined to see what kind of effects and correlations exist between the two.

RESULTS

OBSERVATIONS

Food deserts exist in each of the five metro Atlanta counties. Some were freestanding and surrounded by areas with adequate access to food, while some of them were situated in adjoining locations. They all varied in size and shape, but many were laid along roads and other divides, where one side of a street would be in an acceptable area and the other would be part of a food desert. Fulton and DeKalb had the largest number of food deserts, with 35 and 29 respectively. Clayton and Cobb had comparable numbers, with 21 and 19 respectively. Gwinnet had a markedly lower number with 11.

The number of food sources did not necessarily follow this pattern. Fulton, the largest county in terms of both size and population, had the highest number of sources, containing 401 of the selected superstores, grocery chains, and fast food restaurants. Gwinnett, which was second in both categories, followed with 378. Cobb, placing third in each, followed up with 343. DeKalb, which is second to last in both categories, contained 259 of the locations inside its confines. Clayton, the smallest and least populated county out of the five, had 122. The businesses themselves were not all even either. Walmart dominated the super store category with 51 locations throughout the chosen metro Atlanta area, and Publix and Kroger both had nearly ten times the locations of the other grocery chains. The fast food restaurants were spread out along a spectrum of sites. Subway and McDonald's were the most numerous, with 224 and 147 establishments respectively. Most of the other stores had somewhere between 20 and 100.

DATA

TABLE 1: GUIDING STATISTICS

	Fulton	DeKalb	Gwinnett	Cobb	Clayton	All
Area Size (square miles)	529	268	433	340	143	1,713
Population Size	920,581	691,893	805,321	688,078	259,424	3,365,297
Pop. In Poverty	16.0%	17.8%	12.6%	11.4%	23.3%	15.2%
Pop. Non-White	53.9%	64.3%	43.8%	36.4%	79.2%	52.0%
Super Stores	20	14	19	22	5	80
Grocery Stores	46	30	43	30	8	157
Fast Food	335	215	316	291	109	1266
Total	401	259	378	343	122	

Table 1 shows the aggregate number of all of the individual stores, businesses, and fast food restaurants that were collected in the different counties, taken from geographic maps software created by Google, as well as general demographics of each county. The data shows how the counties then compare to one another. The final column shows the total number of places in all of the counties, and the final row shows the total number of locations inside each one.

TABLE 2: FOOD DESERTS

	Fulton	DeKalb	Gwinnett	Cobb	Clayton	All
Food Deserts	35	29	11	19	21	115

Table 2 shows the total number of food deserts in the Metro Atlanta area, separated by which county they appear in, taken from a USDA Food Atlas. The final column shows the collective number of deserts.

TABLE 3: FOOD SOURCE AVAILABILITY

	Fulton	DeKalb	Gwinnett	Cobb	Clayton	All
Super Stores	2	3	1	4	3	13
Grocery Stores	2	8	1	4	3	18
Fast Food	69	51	21	77	51	269
Total	73	62	23	85	57	

Table 3 shows the number of stores, businesses, and fast food restaurants that are located inside food deserts in their respective counties. The location of the food sources were mapped out using Google and then compared with their relation on the USDA map.

TABLE 4: FOOD SOURCE DISTRIBUTION

	Fulton	DeKalb	Gwinnett	Cobb	Clayton	All
Super Stores	10.0%	21.4%	5.3%	18.2%	60.0%	16.3%
Grocery Stores	4.3%	26.7%	2.3%	13.3%	37.5%	11.5%
Fast Food	20.6%	23.7%	6.6%	26.5%	46.8%	21.2%
Total	18.2%	23.9%	6.1%	24.8%	46.7%	

Table 4 shows the percentages of the food stores that are within food deserts inside the counties.

The two aggregated collections of values show the amounts broken apart by the total in relations to counties and type of distributor.

TABLE 5: POPULATION STATISTICS

	Fulton	DeKalb	Gwinnett	Cobb	Clayton	All
Total Pop.	920,851	691,893	805,321	688,078	259,424	3,365,567
Food Des. Pop.	153,794	150,547	69,514	104,713	117,115	595,683
Pop. In Des.	16.7%	21.8%	8.6%	15.2%	45.1%	17.7%
Pop. In Poverty	16.0%	17.8%	12.6%	11.4%	23.3%	15.2%
Pop. Non-white	53.9%	64.3%	43.8%	36.4%	79.2%	52.0%
Pop. w/ Diab.	8.0%	9.9%	8.1%	8.9%	11.2%	9.2%

Table 5 shows the inhabitants of the metro Atlanta area. The first row is the total number of people that live in the individual counties, and the second row is the number of people who live within designated food deserts inside the counties. The third row shows the percentage of people inside the counties living inside food deserts. The fourth row shows the percentage of the population that has type II diabetes within the counties. The fifth and six reiterate important points from the first table.

DISCUSSION

SIGNIFICANCE OF RESULTS

The data, while not as strong as I hoped it would be, does have significant implications, with patterns and trends being easily seen in the statistics. General food access is harder to come by, with fast food restaurants greatly outnumbering the healthier grocery stores and supermarkets, although the absolute amounts do seem to scale with size and population. The number of food deserts themselves do not however follow this trend, with outliers like Gwinnett having smaller number proportionally, and Clayton having a much larger amount. The data did seem to revert to more easily identifiable trends with later analyses, such as when higher levels of fast food locations were identified within deserts. Perhaps the most useful trend that appeared time and time again were the statistics garnered from Clayton county. The territory, while smallest in size and population, had the largest number of residents within food deserts, the smallest proportional number of healthier options, and the largest number of occupants with diabetes. While a lot of the data may not have followed continuous patterns, the relationships

between the trends that were being studied and their prominence within Clayton County showed time and time again.

One of the most important results is the confirmation that food deserts do exist, and have clearly visible characteristics and unique features that are not seen in other geographic areas surrounding them. These findings also help build off and support similar claims that have been made by the Atlanta Research Commission, or ARC, who have not only also identified the locations of the food deserts inside the metro area, but have also done research on their own that has allowed them to publish reports on the “disproportionate number of lower-income people without access to nutritious food” because of the locations of the supermarkets in the area²⁴.

With over a hundred different food deserts and almost thirty different dining options compared to one another, that data helps bolster the claims made by the studies ARC has put forth. There are some aspects of the data that may confuse this idea. After all, in most instances each food desert does have at least one eating location inside it. But this does not mean that these stores are sufficient sources of nutrients for their citizens. A handful of fast food businesses, or perhaps even a grocery store, may not be nearly enough to sustain a local populace. The number of people could require more sources. The people living there may not have enough money to afford the few options around. There is a chance that the people, due to the infrastructure or lack of personal transportation, might not even be able to reach the food.

The other important conclusion is the impact of these locations on the prevalence of type II diabetes. The percentages increase and decrease in varying levels that coincide with the trends that were seen with the collected statistics on food deserts. Counties with more food deserts

²⁴ Giang, T., Harries, C., Treering, D. “Food for every child: the need for more supermarkets in Georgia.” *Philadelphia: The Food Trust*, 2011. 8.

tended to have higher levels of diabetes by several percentage points. While there may be other factors and influences on these statistics, the correlations still seem exist. Alternatively, the counties that had few food deserts and larger numbers of restaurants were also observed to be living healthier lives, and possessed statistics that pointed to the residents being diagnosed less frequently with a form of diabetes.

The strongest case from the data is Clayton County. It has the smallest population, but the most prominent results. 45% of the population resides inside a food desert. It also possesses more food deserts than Cobb and Gwinnett County, both of which are much larger and more than three times the residents of Clayton. It should be noted that there is a possibility that poverty and racial factors could be of some relevance here, although the scope of my research did not allow me to fully dive into those possibilities. While a significant proportion of its stores are inside food deserts, this is because the county itself has very few locations, not because of there being an overwhelming number of them in total. Clayton County also shows a strong correlation between diabetes and the food deserts. 11.2% of its population has type II diabetes. This is higher than all of the rest, coming in more than three percent higher than Fulton and Gwinnett.

RELATIONSHIPS AND PATTERNS

Relationships exist within the data, but they are somewhat complicated. There is a trend between the number of people living inside food deserts and the percentage of the population diagnosed with type II diabetes. Areas with a larger percentage of the population living in areas classified as food deserts have higher percentages of diagnosed diabetes cases.

The number of stores that showed up in the counties also had trends. Walmart, Publix, and Kroger had a number of locations and dominated their markets, while their main competitors

were scarce. Organic stores were very rare, and didn't appear at all in Clayton county, the most impoverished and diabetic county in the study, a detail of notable significance. This relationship seems almost like an epitome of the environment located there. In fact, compared to the rest of the options, grocery stores were very scarce in general in that region. There were also instances of superstores staying out of the region. Another trend that was a little unexpected was the penetration of chain restaurants in the metro Atlanta counties. From the most abundant stores like McDonald's and Subway to the rarer ones like Quiznos and Sonic, each business had at least one branch inside every county. Even if the presence in the area was small, it still existed. The most plentiful businesses also had the largest number of sites in food deserts, but this seemed to be more because of the generally high numbers than anything else.

The data also shows that not every location in the five county area without a plethora of food businesses contains a food desert. Some locations had large collections of different stores, and some had these eateries spread out over large swaths of land. But as expected, these could not cover every inch of the counties. There are reasons why these places would not be considered food deserts for a number of reasons. The area may be covered in a forest or other uninhabited land. These locations would not need to worry about having adequate sources of food if there is no one to feed. There may also be a number of local groceries or locally owned and operated restaurants and sources that were not taken into account during the research. The selected stores and not the only ones in the area, just the most prominent. But it is very feasible for a larger number of smaller businesses to be effective at feeding an area than a few larger-profile stores would.

EXCEPTIONS

Fulton is an exception to the data and somewhat skews the results. It has the lowest incidence of diabetes in its population, but has the third largest percentage of citizens inside food deserts. If this data set was excluded, the data would trend in a much more linear fashion. It also possesses a much larger population, and contains more stores than any of the other counties that were examined.

There are likely explanations for Fulton having characteristics that separate it from the trends that the other counties experienced. The degree of inequality within the county is much higher than the others in the state, with an extraordinary amount of people within it at the top and bottom of Georgia's economic hierarchy. This may not be completely isolated to Fulton, but it is much more common and possesses much higher levels of variation. Next, the majority of the metropolitan Atlanta area lies within its borders. The composition of this portion of Atlanta is unique. Not only does it contain areas that consist primary of skyscrapers and gentrified neighborhoods, but it also has large swaths that are full of public and standardized housing. Unlike other areas where you see some kind of geographic separation between these different areas, Fulton contains all of them. It also extends and expands north to areas that have higher income levels, but also to the South and the West of the city, encompassing much less prosperous sections. Even the shape of the county is peculiar, appearing as an amalgamation of areas that are their own entities and would be much better represented if they were split off, apart from the devastating economic fallouts that could likely appear if the poorer areas were suddenly stripped of the binding connections and support.

Another county that stands somewhat as an outlier is Gwinnett. All of the data shows that it is much healthier than the rest of the counties, both in diabetes incidence and in the number and prevalence of food deserts. It has the second largest population of the examined counties, but the smallest number of individual food deserts. It also had only slightly fewer restaurants and businesses than Fulton, and the smallest number of them were in food deserts. Even though it is part of the metro Atlanta area, its composition is much closer to a county that is farther away from the capital. The county itself is not only larger and less condensed than the others, but is highly residential and full of middle-class families, with the highest income of any of the five counties, with Cobb being the only comparable one.

TAKEAWAYS

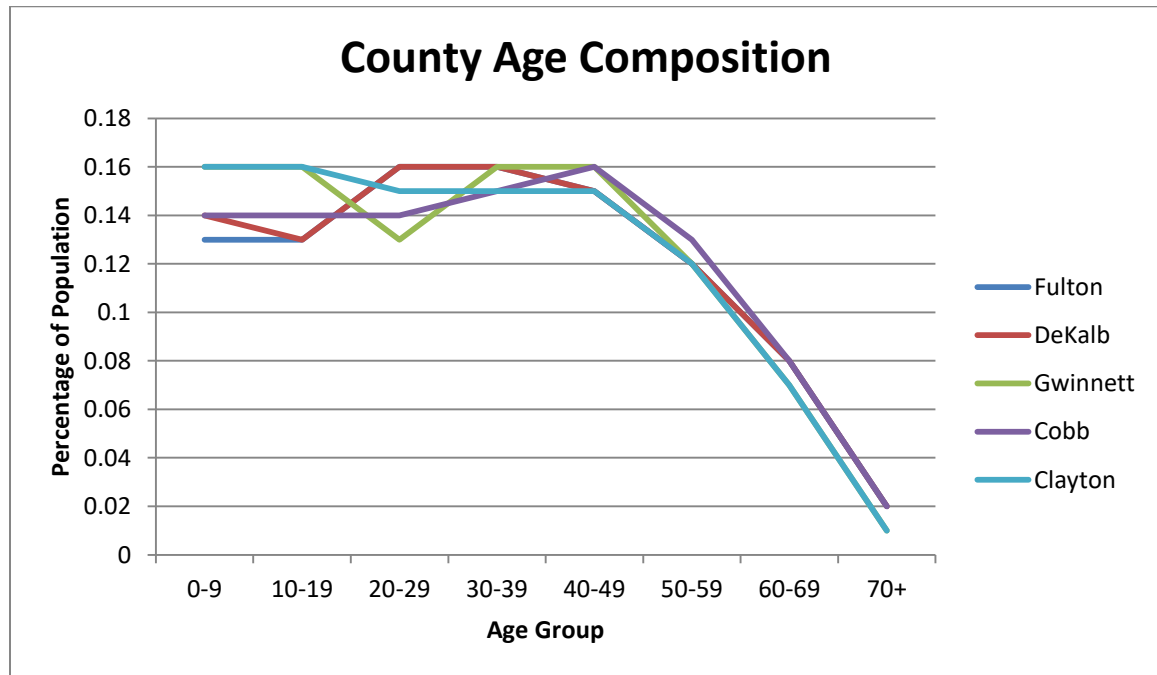
Food deserts are prominent in the Atlanta area. Counties with a larger percentage of the population living in a food desert are likely to have higher rates of diagnosed type II diabetes. The data above shows that the volume of food deserts and the incidence of type II diabetes are not randomly distributed around the region. They are concentrated in the same locations, locations that are strewn with poor access to healthy food and citizens in need. It also shows the current landscape of the dining industry. The maps show how fast food locations have multiplied around the metro Atlanta region while grocery stores have become much less common relative to the population, with there being only 157 identified grocery stores in the five counties for the 3,365,567 million people living inside them, averaging out at 21,437 people per grocery store. It is surely a daunting task for such a small number of stores to try and adequately supply healthy food to the number of people. Adding in the 80 superstores does some to alleviate the problem and increase accessibility, but with the levels of the diseases in the region, most likely is not sufficiently bolstering the supply of healthy alternatives to fast food. There is a very serious

issue in the Metro Atlanta area that needs to be addressed. The population has been rising in the city for over a hundred and fifty years, with no stop in sight. Available land however, has been not been. Towers can be built up and some establishments can be razed, but new and open land is not forming. The only way to create useable sites is to destroy things that are already in existence, something that cannot always be done. Unless the issue is addressed, more and more people will be living with access to unhealthy food and will grow up in environments that foster harmful eating habits and morbidity and diseases like type II diabetes. Hopefully with enough research, the issue can be properly targeted, and then properly handled.

ADDITIONAL DEMOGRAPHIC FACTORS

Other demographic factors not included in this analysis may contribute to variances in the prevalence of diabetes by county. For example, each county has a different age composition. As seen in Figure 1, Clayton and Gwinnett have larger percentages of their population who are adolescents. Fulton and DeKalb have larger numbers of young adults, ranging from 20 to 40 years of age. All of the counties' populations decline at roughly the same rate as the age increase. This can have an impact on the causation of diabetes. Children and teenagers have less of a say in what they consume. They can voice preferences and have favorite foods, but they are almost completely reliant on their parents to provide them with food. The overwhelming majority of this group also has no personal form of income. Overall, they must consume what is provided for them. If this is the case, then it is not the food deserts alone, yet rather the food deserts in conjunction with the lack of power and opportunity that they have, not solely the lack of availability.

FIGURE 1: AGE



Income and poverty are two other important demographical factors when scrutinizing diabetes. Value meals and bulk orders from fast food restaurants are much cheaper than healthier, organic produce. It might be possible that poorer counties cannot afford healthier food, and it is their average salary that limits their choices, not the locations and local options. Figure 2 shows that the county with the lowest average number of diagnosed type II diabetes cases, Fulton, is also the county that topped out the number of households at each income level. It also shows that Clayton County, the county with the largest rate of type II diabetes, had a much smaller middle class (households with an average income level) and very few households that had an income above the median ranges. If this is the case, then the presence and number of food deserts are independent of the disease. However, Figure 8 shows the percentage of

individuals in each county that live in poverty, and this data seems to contradict this idea, with Fulton County possessing that largest percentage, followed by DeKalb County.

FIGURE 2: INCOME

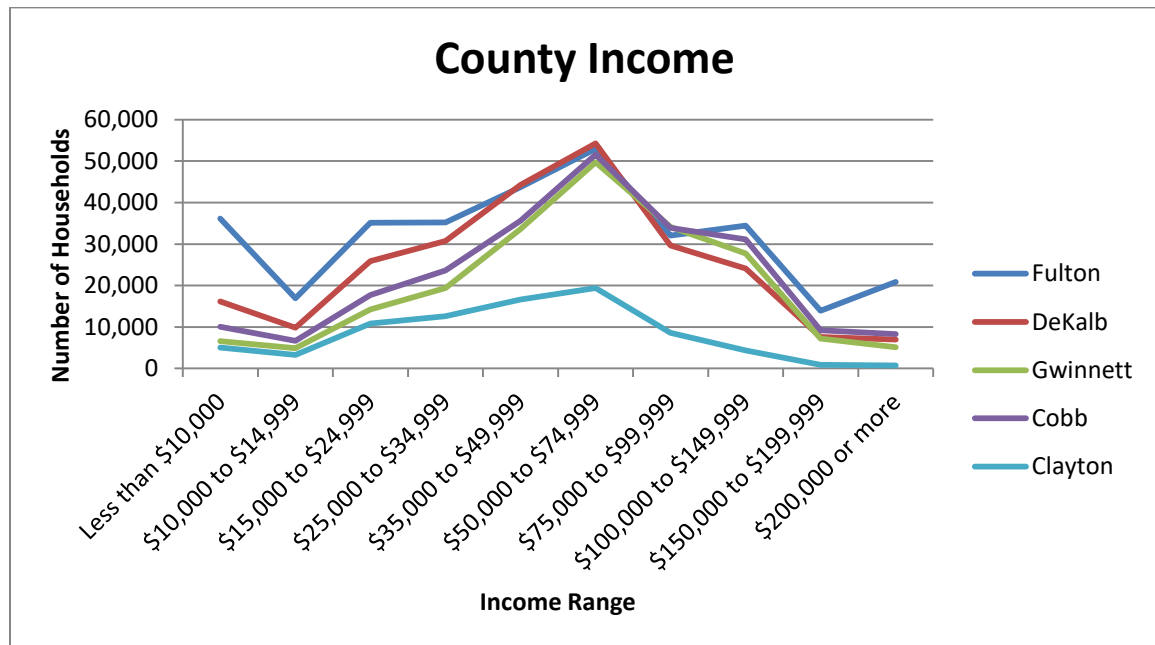


FIGURE 3: POVERTY

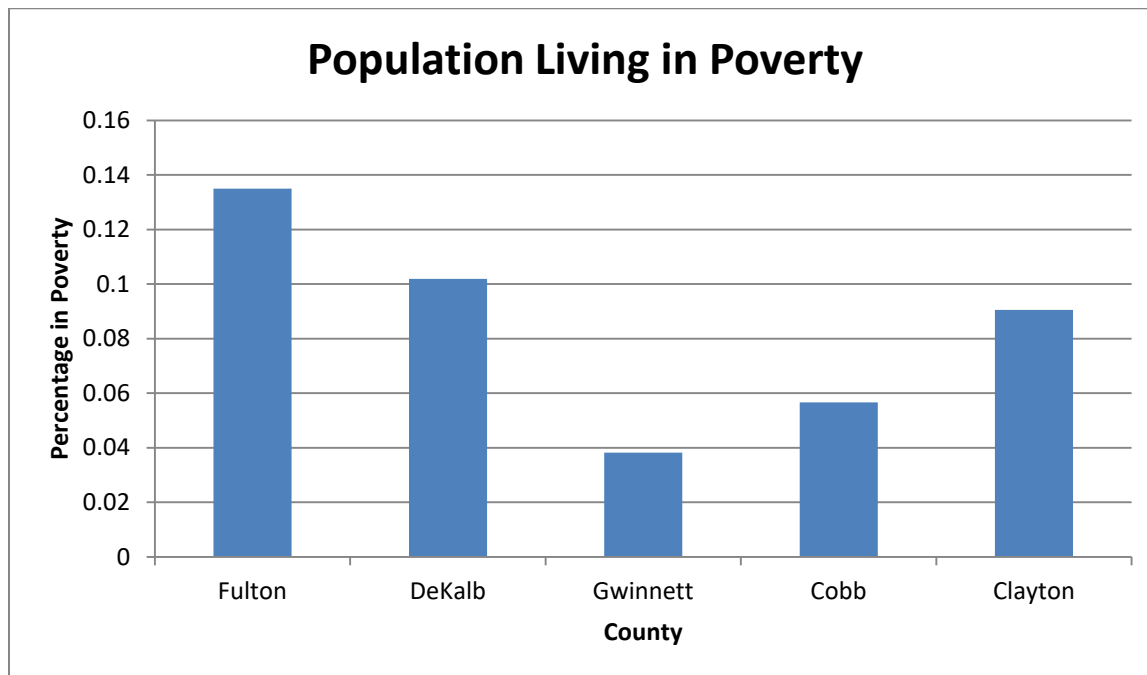


Figure 3 shows the percentage of individuals in each county that live in poverty. Fulton and DeKalb lead the group both in terms of pure numbers, with 124,241 and 70,484 people respectively, and by percentage, while Gwinnett County has the second lowest number at 33,067 people, and by far the smallest percentage.

A final possible alternative hypothesis is the possibility that there is no single, quantifiable element that can be argued or justified as the origin of the differences in the levels of type II diabetes in the population. Most people would argue that to some extent. This has to be the case. The two do not exist in a vacuum, and are constantly being affected by other elements to varying degrees. One cannot expect that when it comes to such a complicated issue as diabetes incidence, all of the different social and biological factors wouldn't have an impact, while food deserts created the only difference. But it could be a possibility that it is these other components that are the real causes, and that food deserts aspects that sprung up as a result.

CONCLUSIONS

The research I conducted seemed to both illustrate some of the relationships I was hoping to find and to muddy the arguments that I thought I could strongly conclude with. The complexities and compositions of the different counties seemed to make it where no one factor could be seen to be the complete reason for something else. The counties seemed to scale proportionally between their size and the number of food deserts and food sources within them, until outliers disrupted the pattern. There seemed to be easily traceable trends when it came to diabetes incidence and food deserts, until the sequence that should have appeared was replaced with one that was not as clear cut. Every time that thought I collected data that could show an infallible trend, it seemed like some element of it was off. There trends that I hoped would carry over from section to sections did not exist in the format that I was hoping. Instead, it did provide one that left me a number of questions and possible elements that could be brought up in future studies. I wanted chart after chart of data that provided each county operated exactly the same, and that given a little bit of information about one, I could see a somewhat standardized operating procedure within them. I was hoping to be able to see a system that was easy test and apply to other places, and I do not believe that I accomplished that.

I do however believe that the study did provide enough evidence to make some assertions on the subject, and to somewhat validate the thesis that I proposed in the beginning about a relationship between rates of diabetes and the presence of food deserts. There may not have been a clear curve in the trends of the data, but some of the tendencies were still there. After looking at everything, you do see that counties like Gwinnett, counties with lower numbers of food deserts and more access to healthy dining options have lower levels of diabetes than their neighbors. At the same time, you can also see that counties like Clayton, ones which have large

swaths of their populations in areas that lack the necessary nutrition options and have very little healthy dining alternatives, have a larger proportions of their populations with the disease. If you can look over some of the inconsistencies that arise from the complexity of the area, you can see that there is a frightening relationship in the metro Atlanta area. You can begin to identify noticeable connections that are seriously harming the lives of some of its occupants. It shows that the decisions people, businesses, and cities make can creating lasting hardships on some while helping others thrive. Intentional or not, it is a problem, and possesses issues that can be identified and approached in order to improve the lives of thousands of people suffering from a disease.

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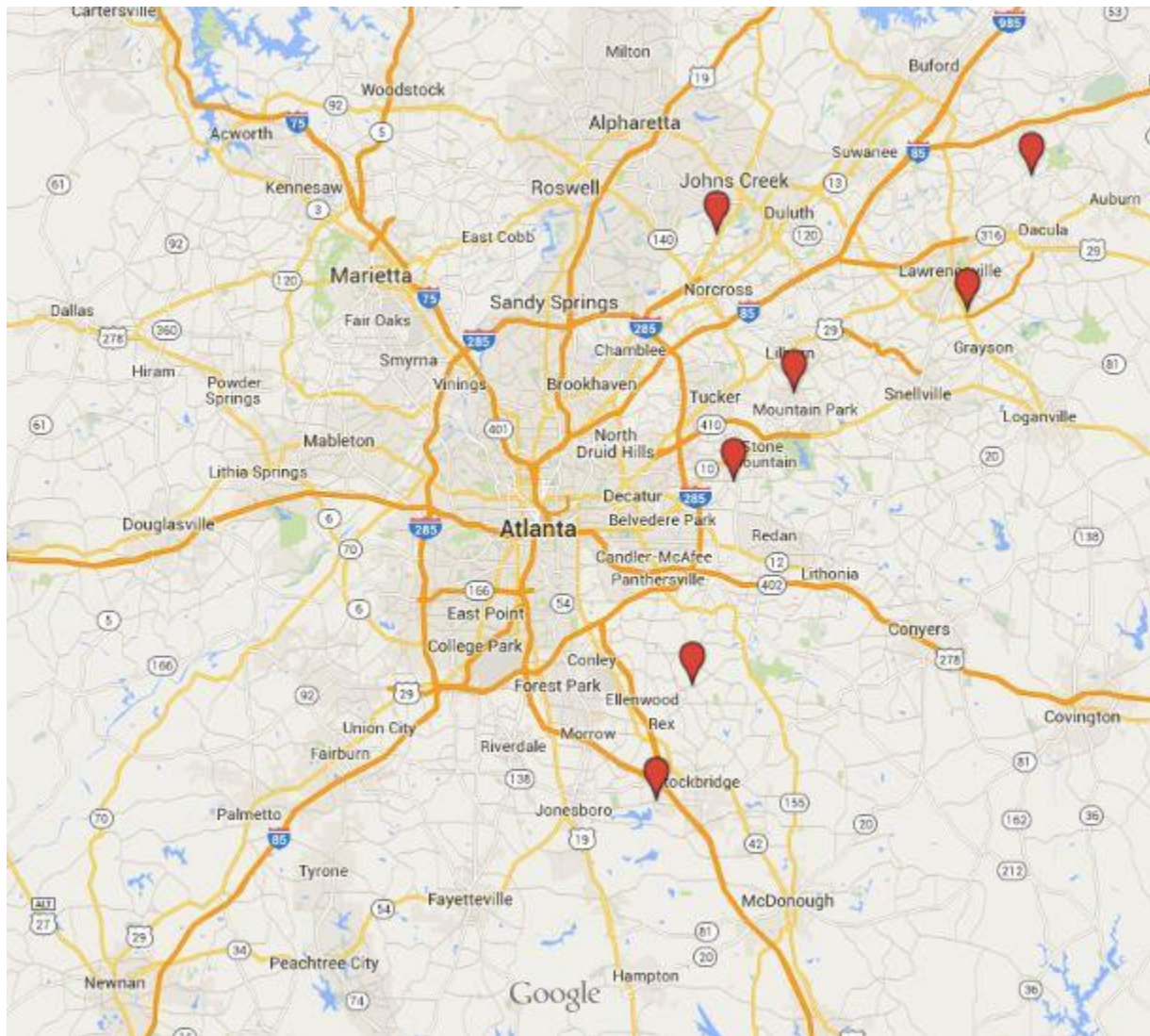
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LOCATION MAPS

All Maps and screen captures below were taken from Google and its affiliated sites.

Grocery Stores – Ingles



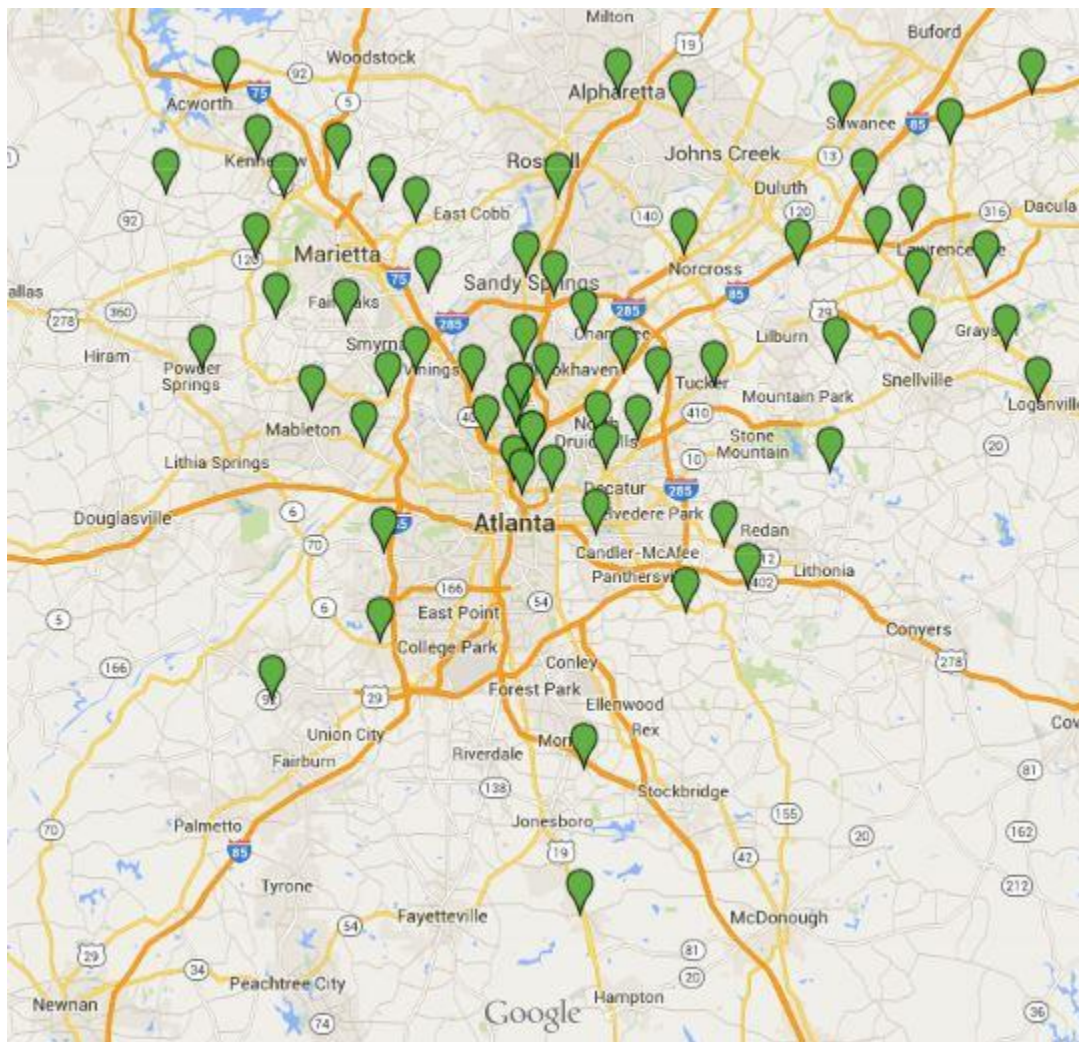
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Grocery Stores – Kroger



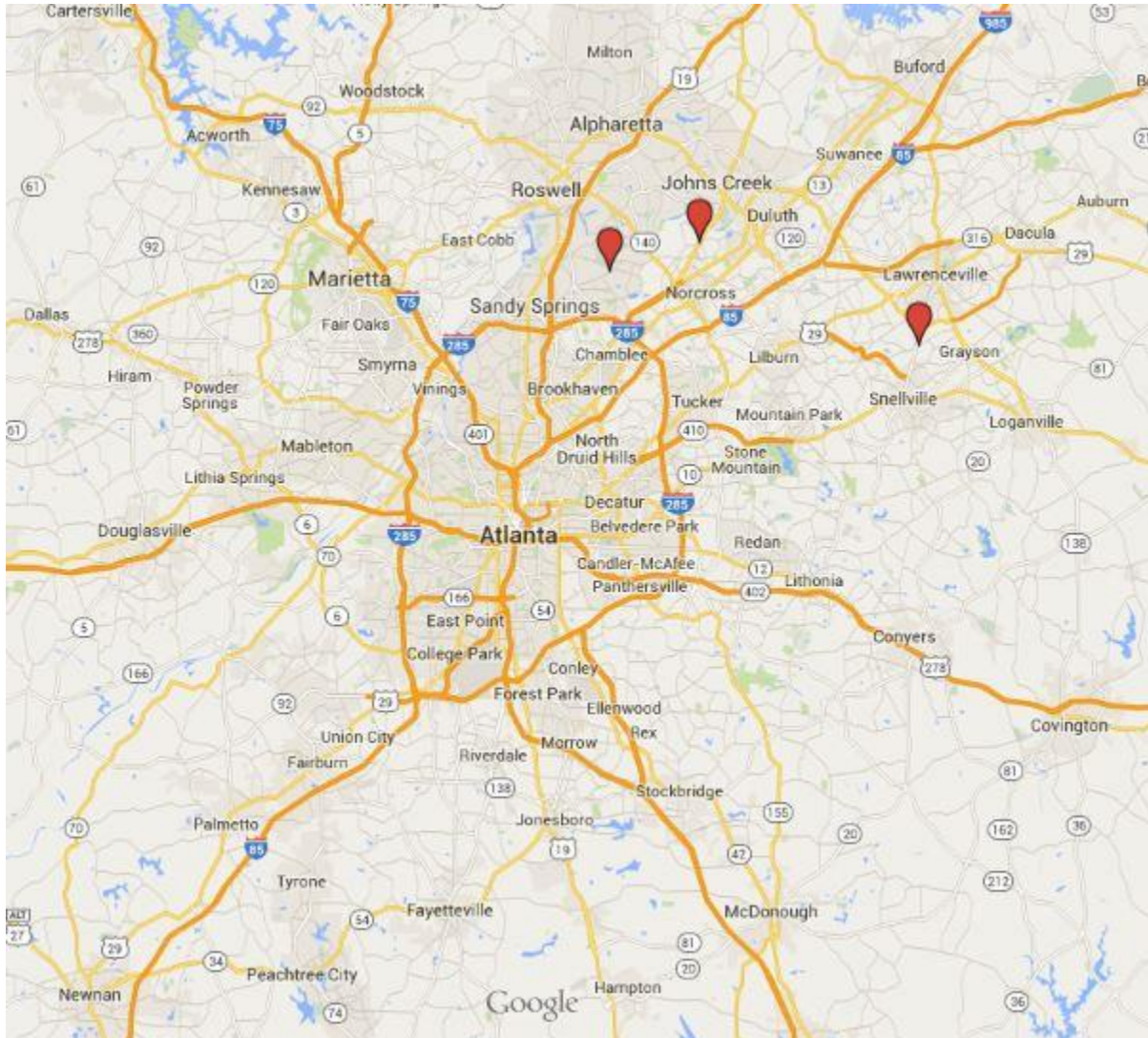
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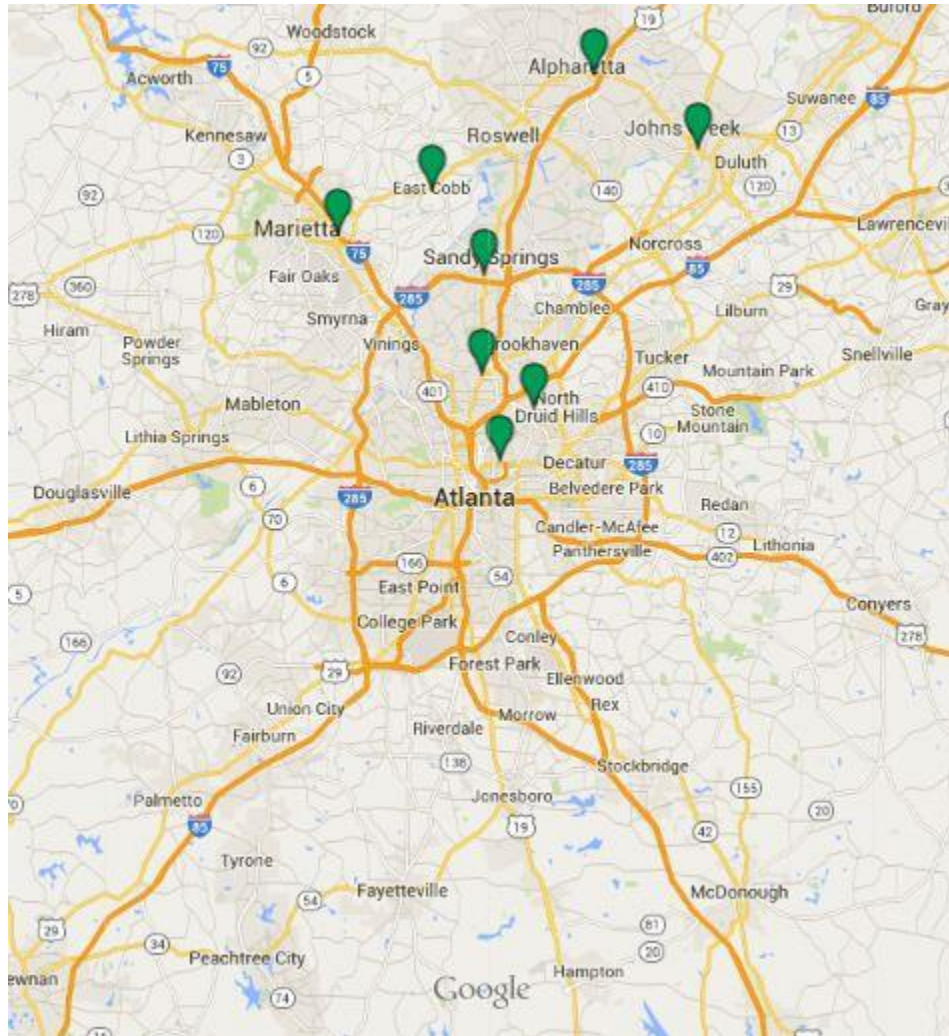
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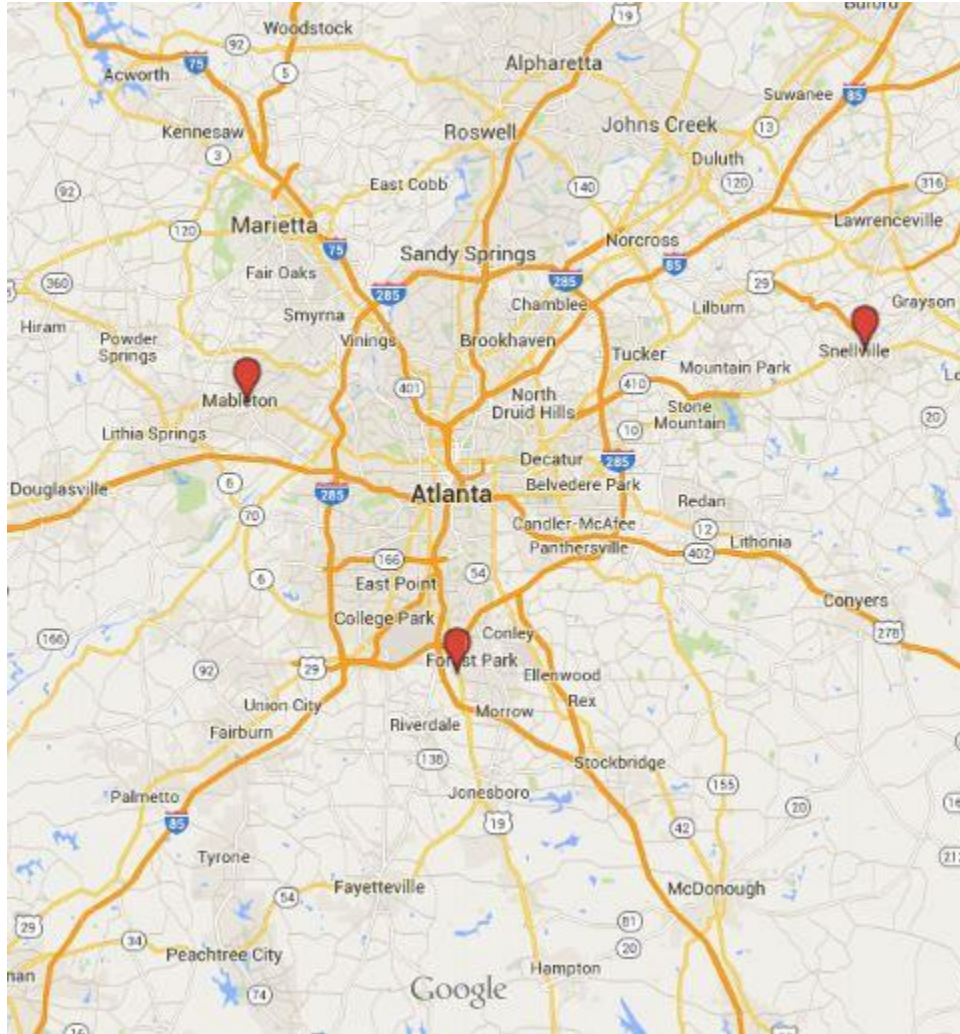
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Grocery Stores – Whole Foods Market



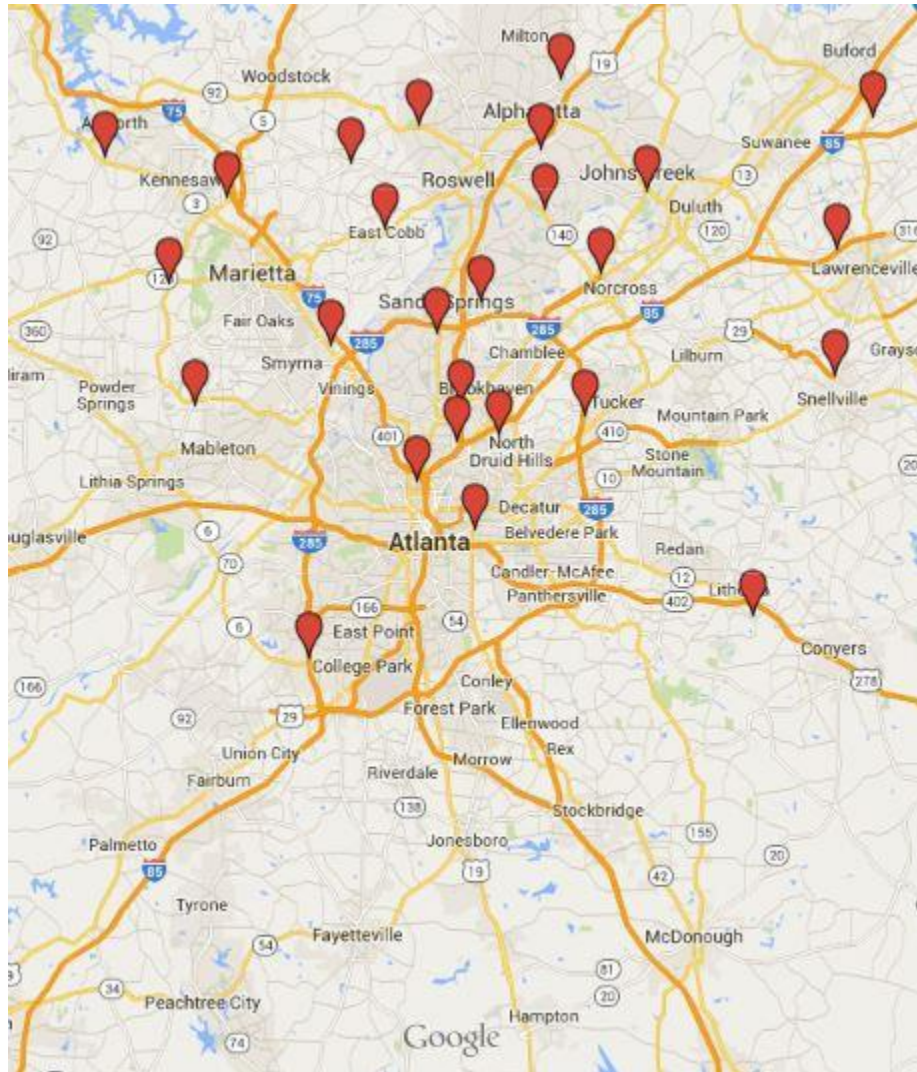
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Super Stores – K-Mart



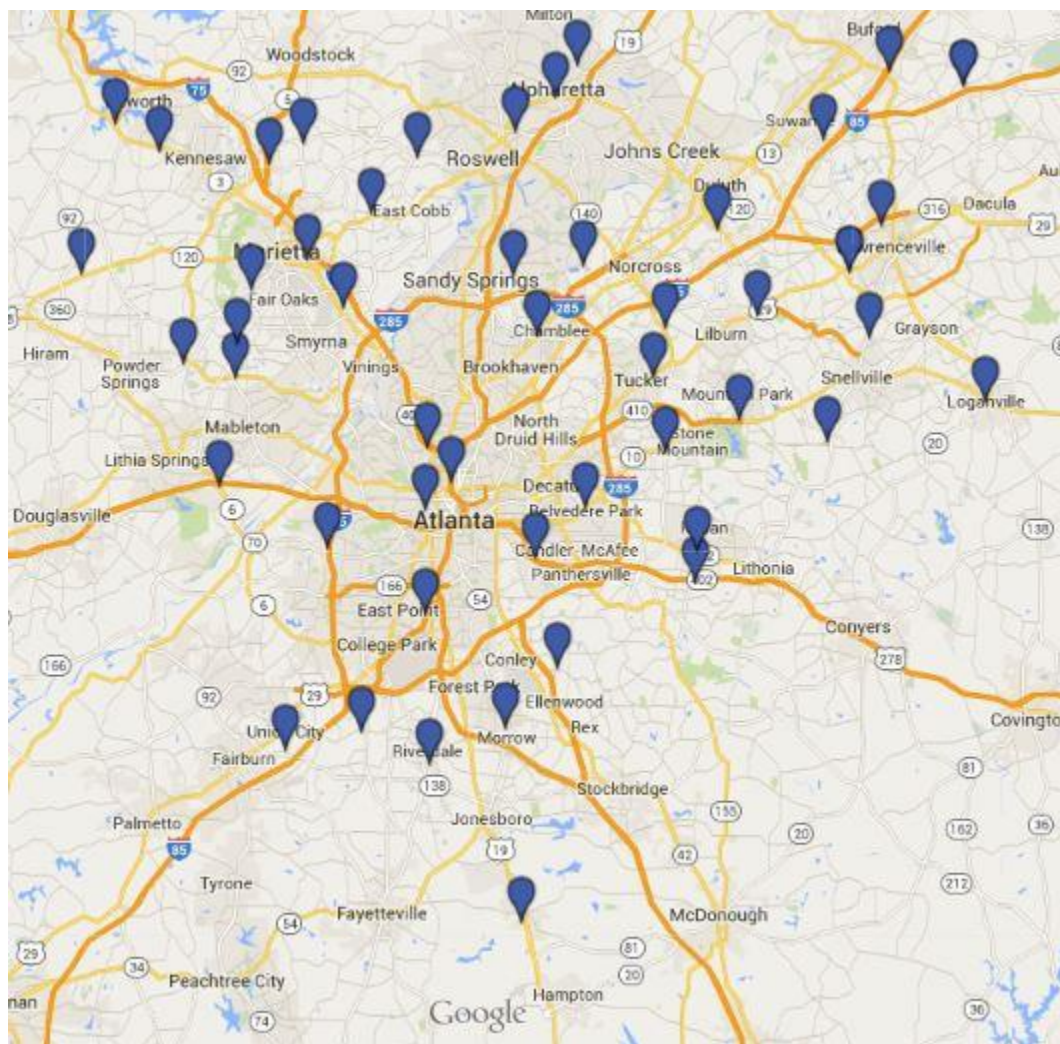
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Super Stores – Target



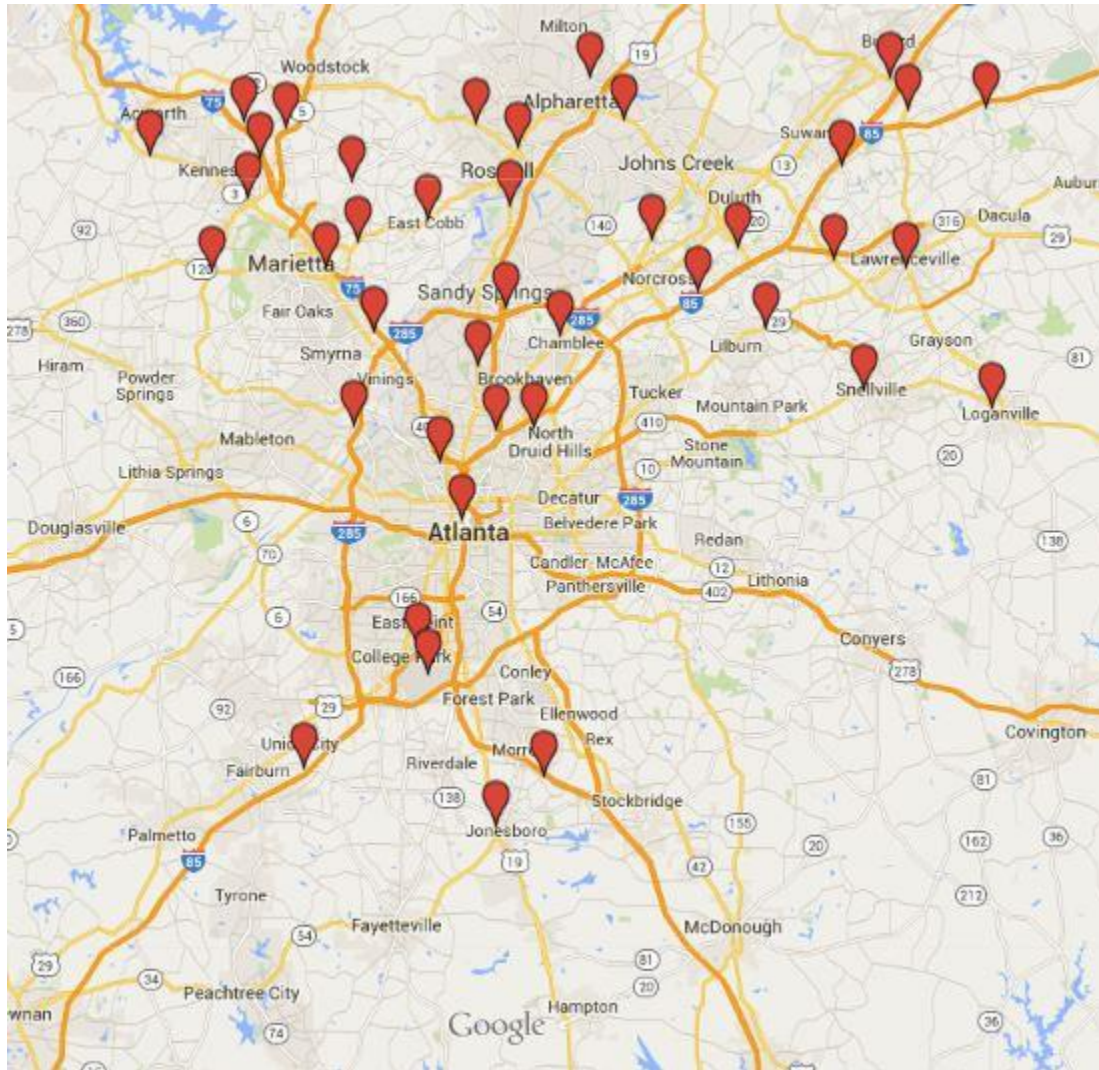
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Super Stores – Walmart



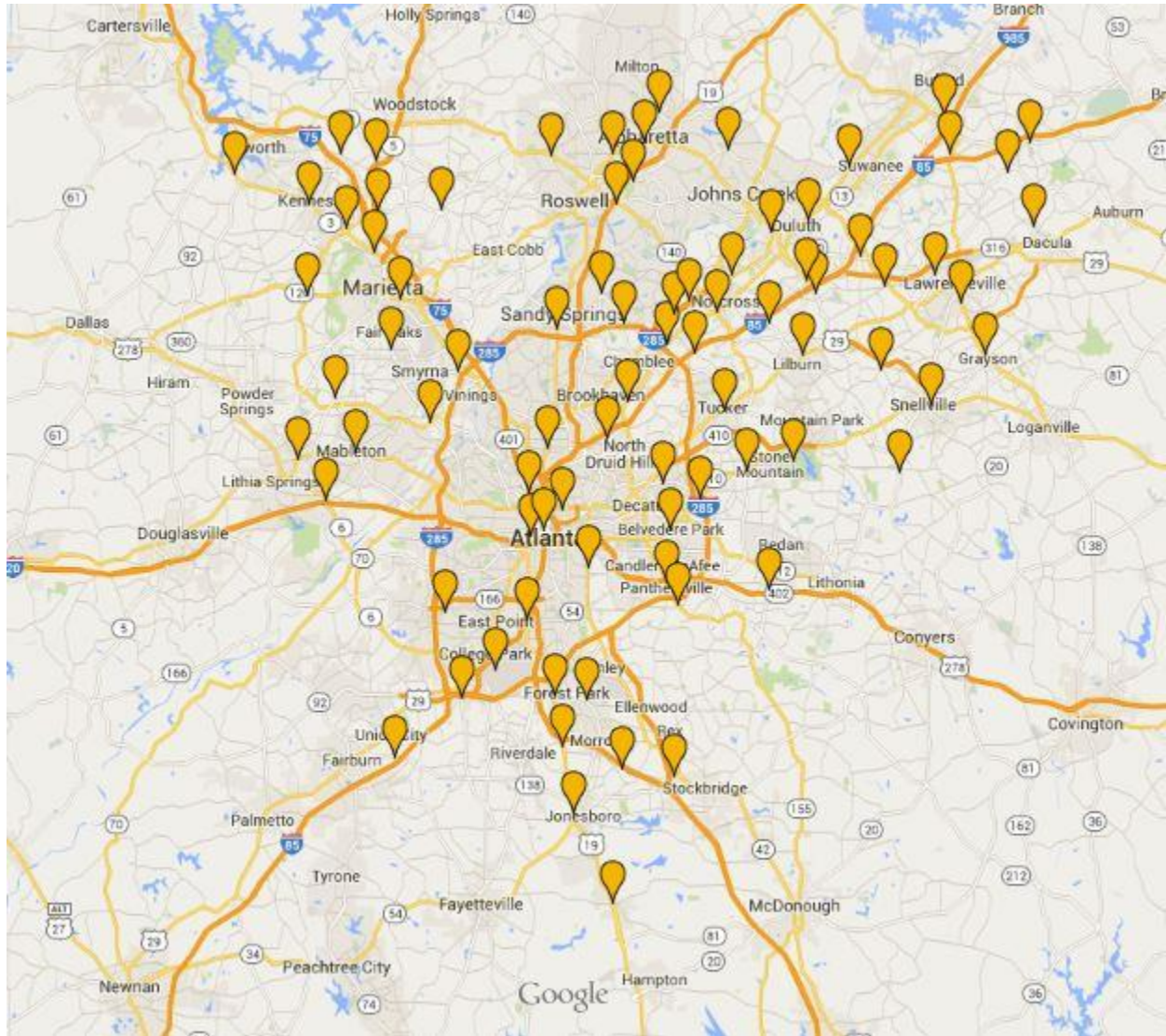
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Fast Food Restaurants – Arby's



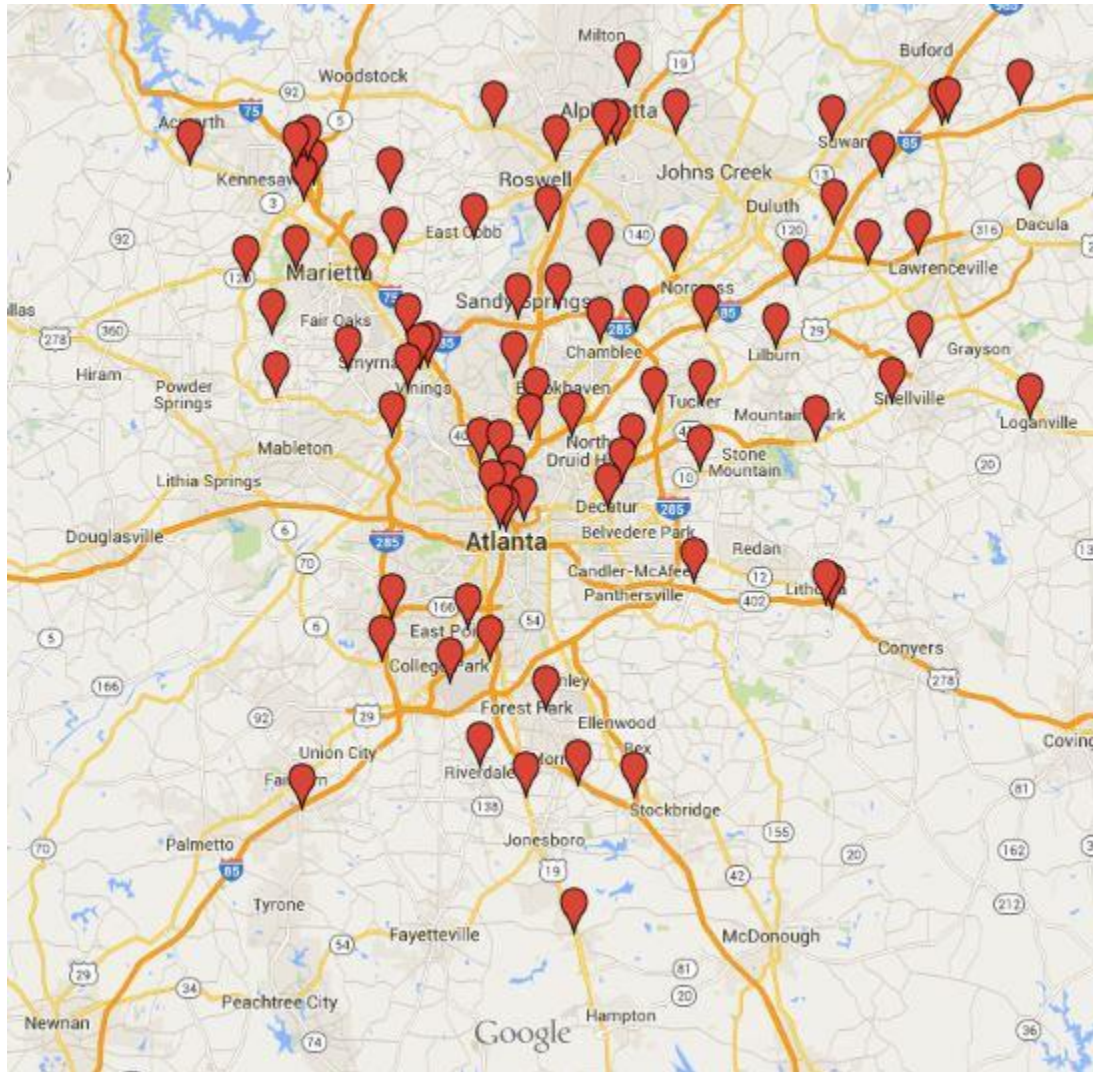
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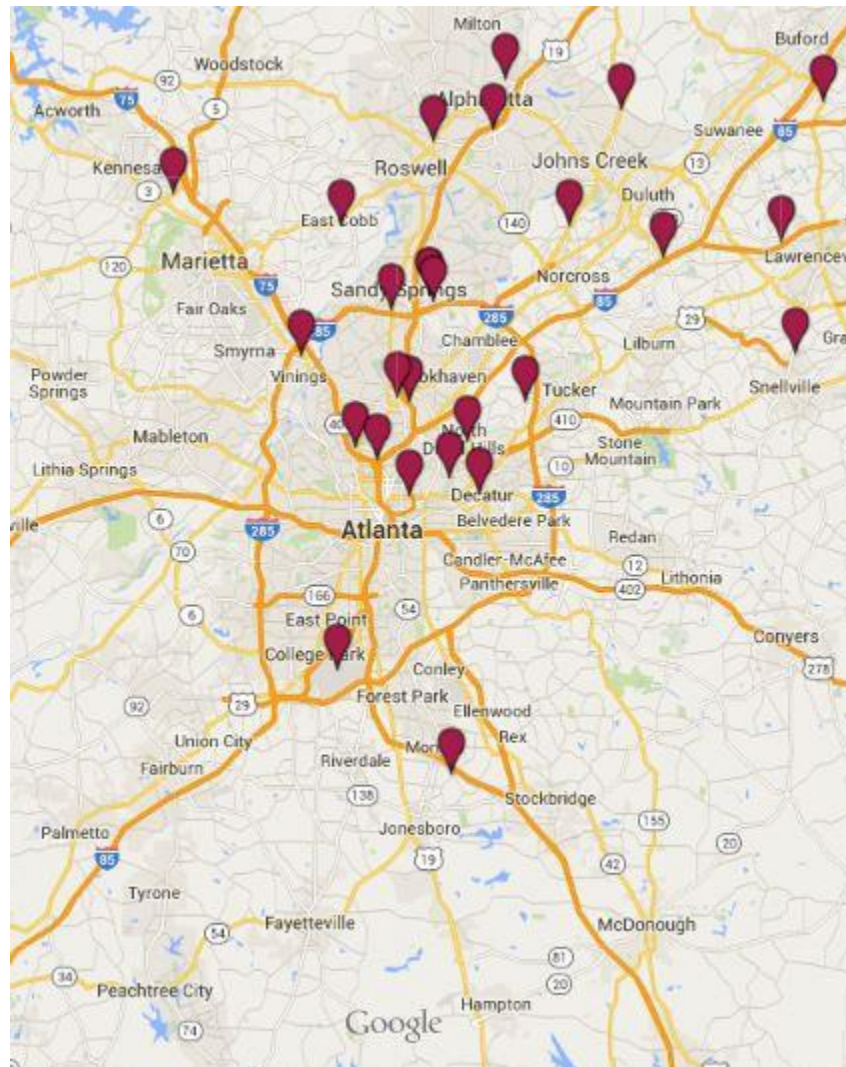
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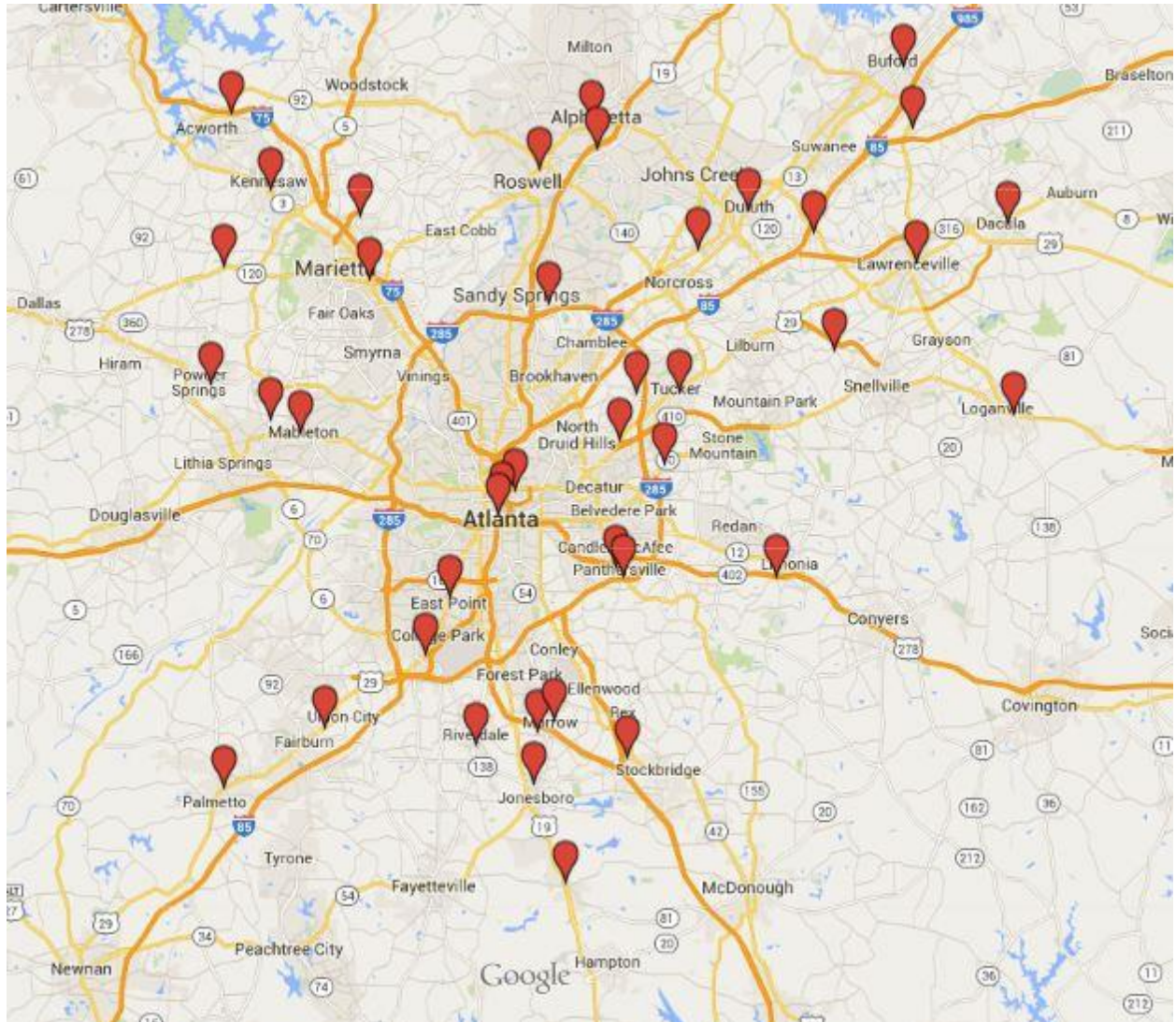
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Fast Food Restaurants – Chipotle



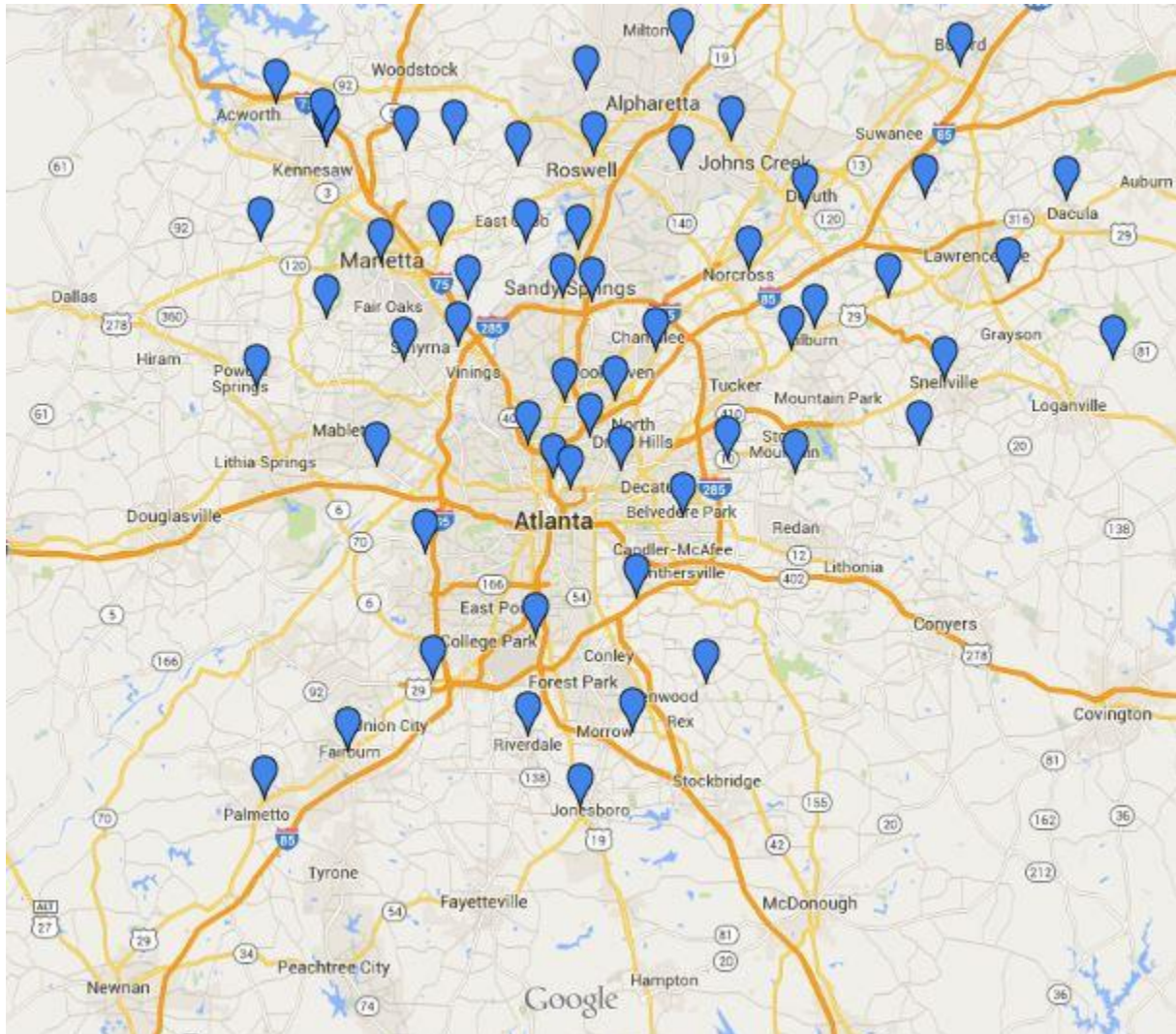
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Fast Food Restaurants – Dairy Queen



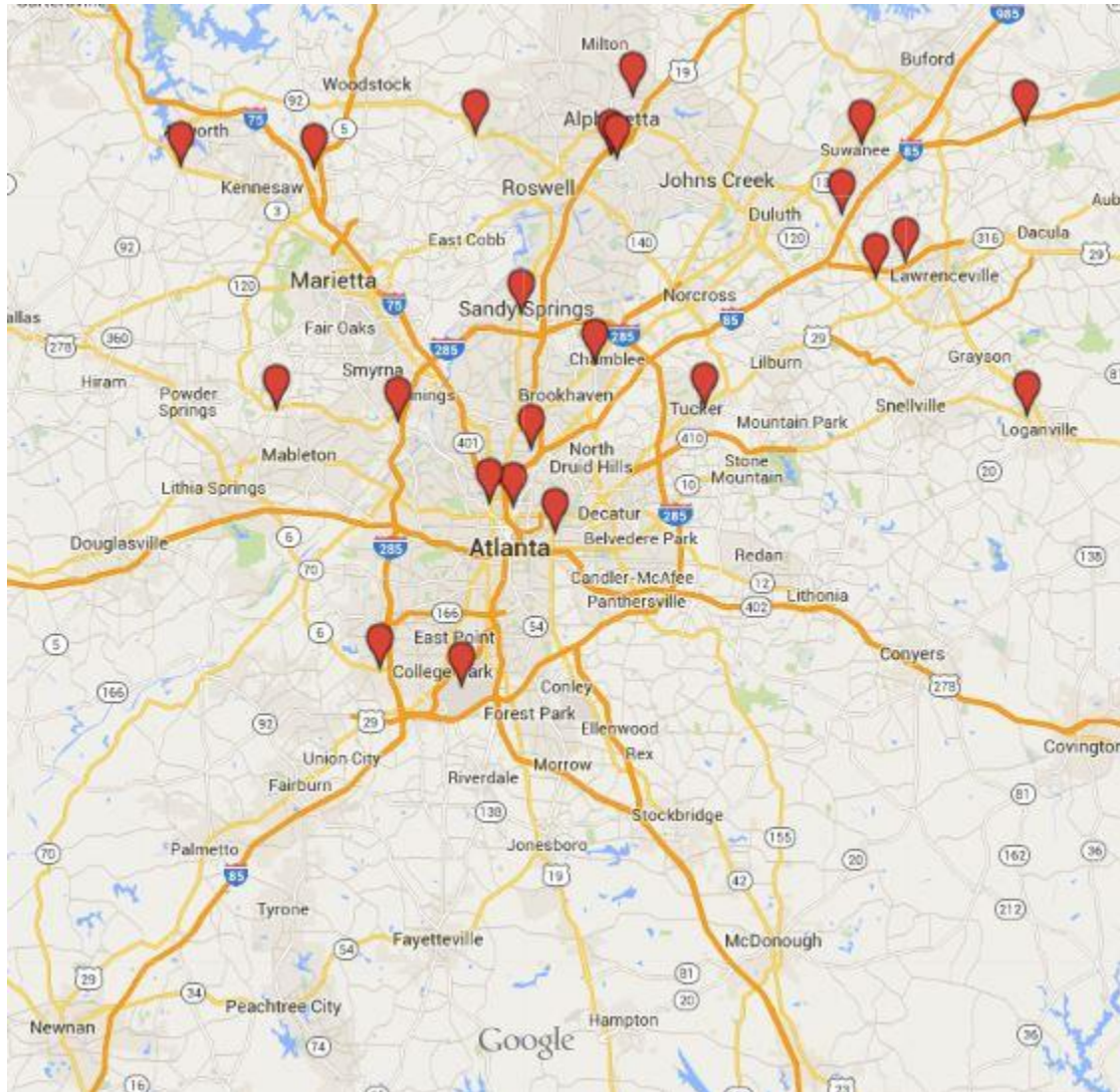
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Fast Food Restaurants – Domino's Pizza



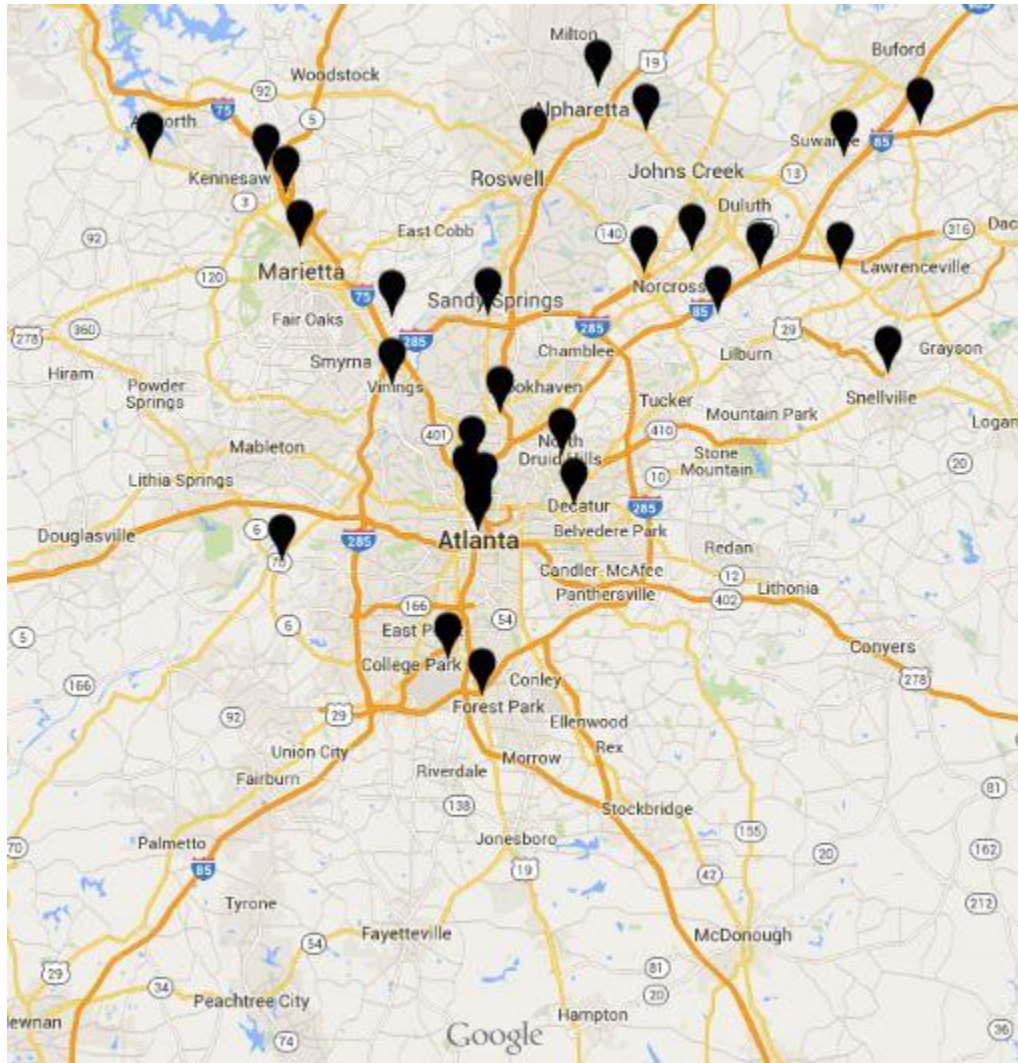
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Fast Food Restaurants – Five Guys Burgers and Fries



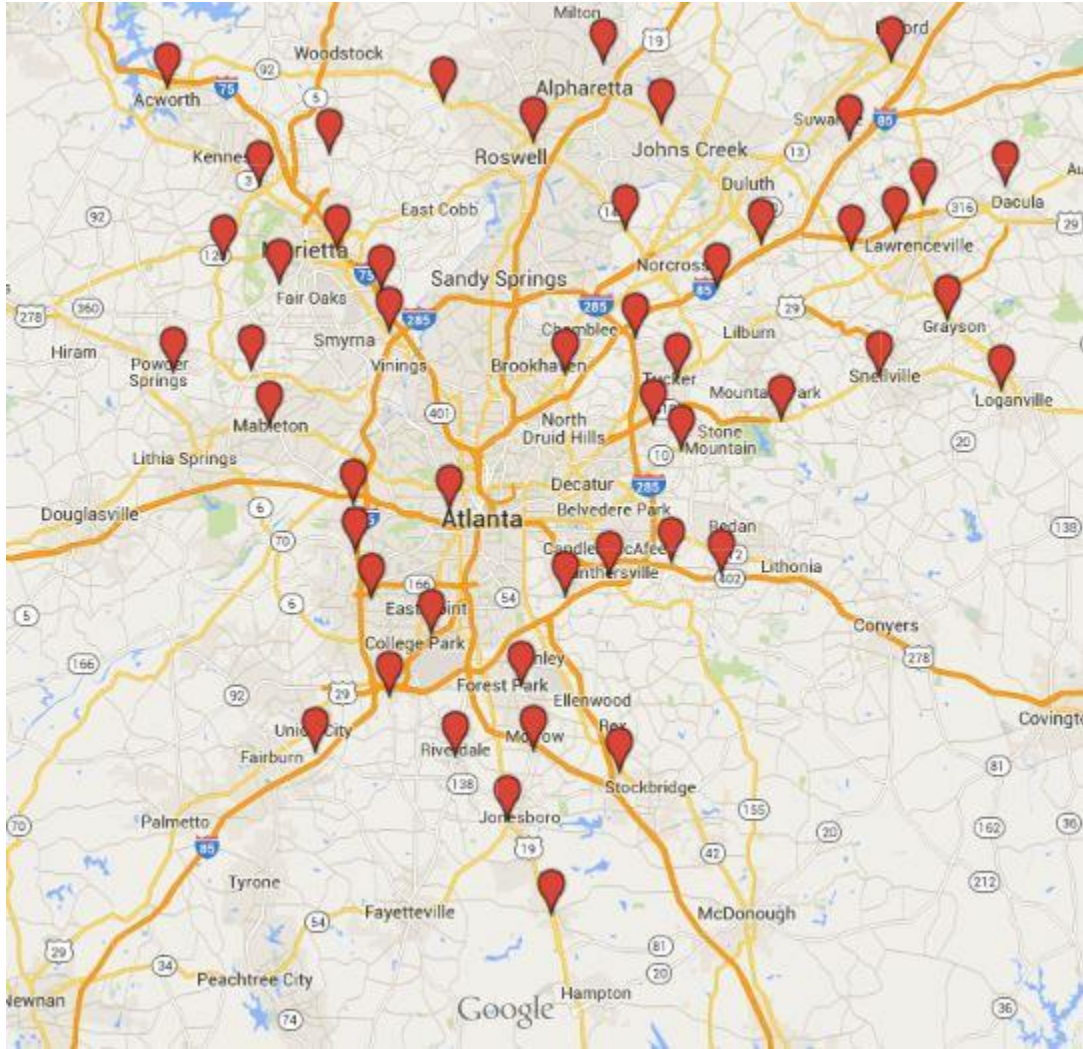
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Fast Food Restaurants – Jimmy John's



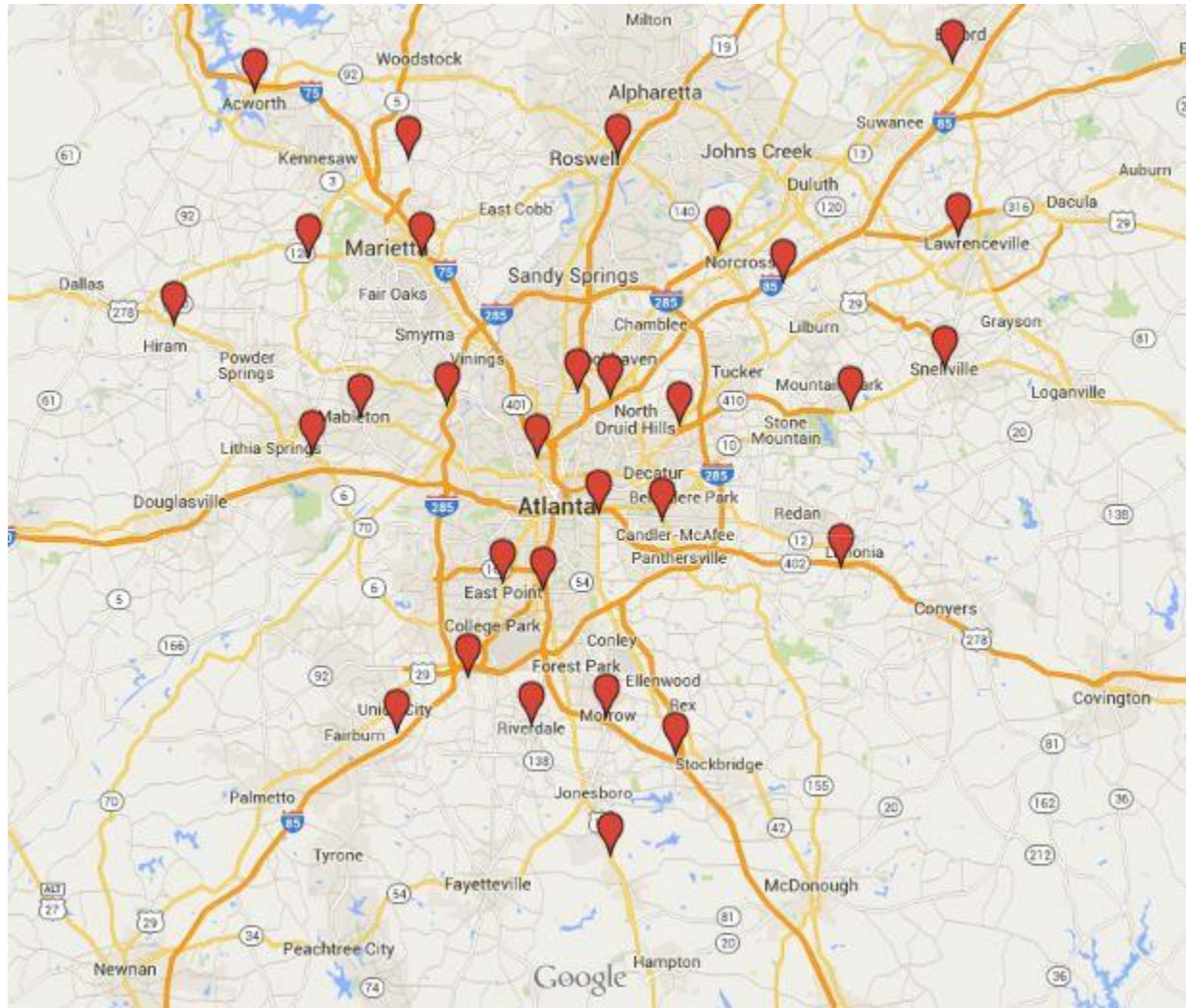
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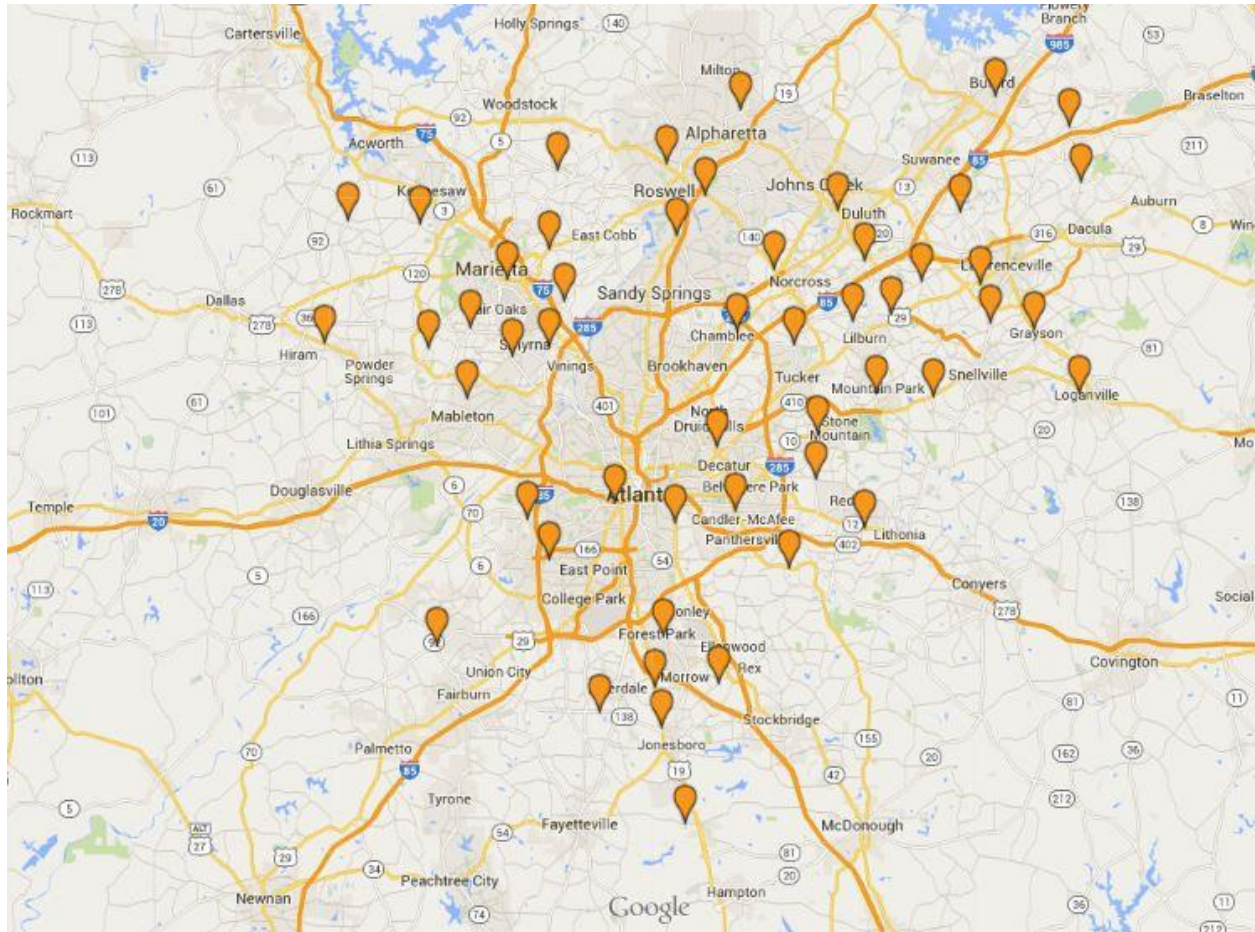
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Fast Food Restaurants – Krystal



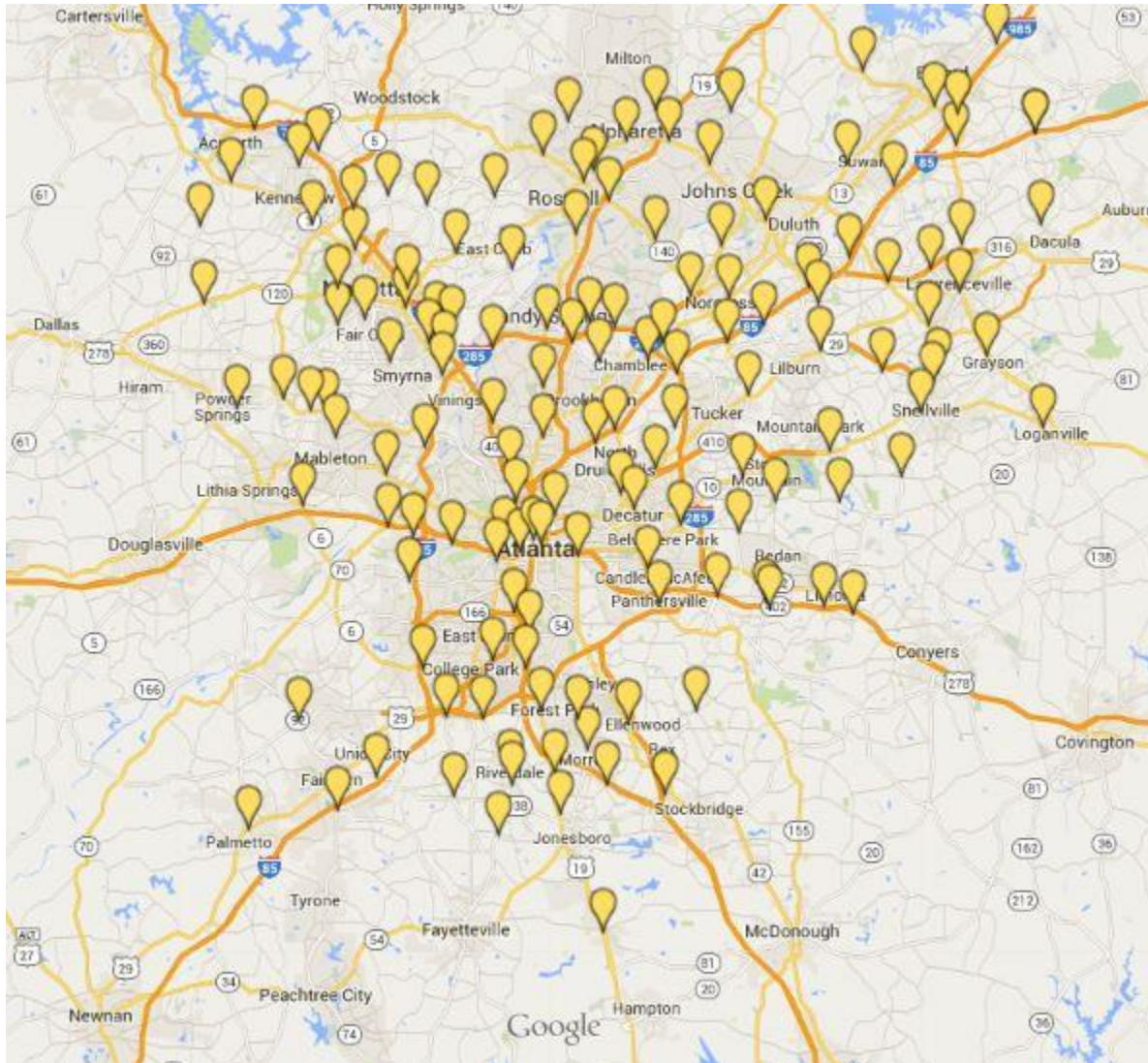
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Fast Food Restaurants – Little Caesar’s Pizza



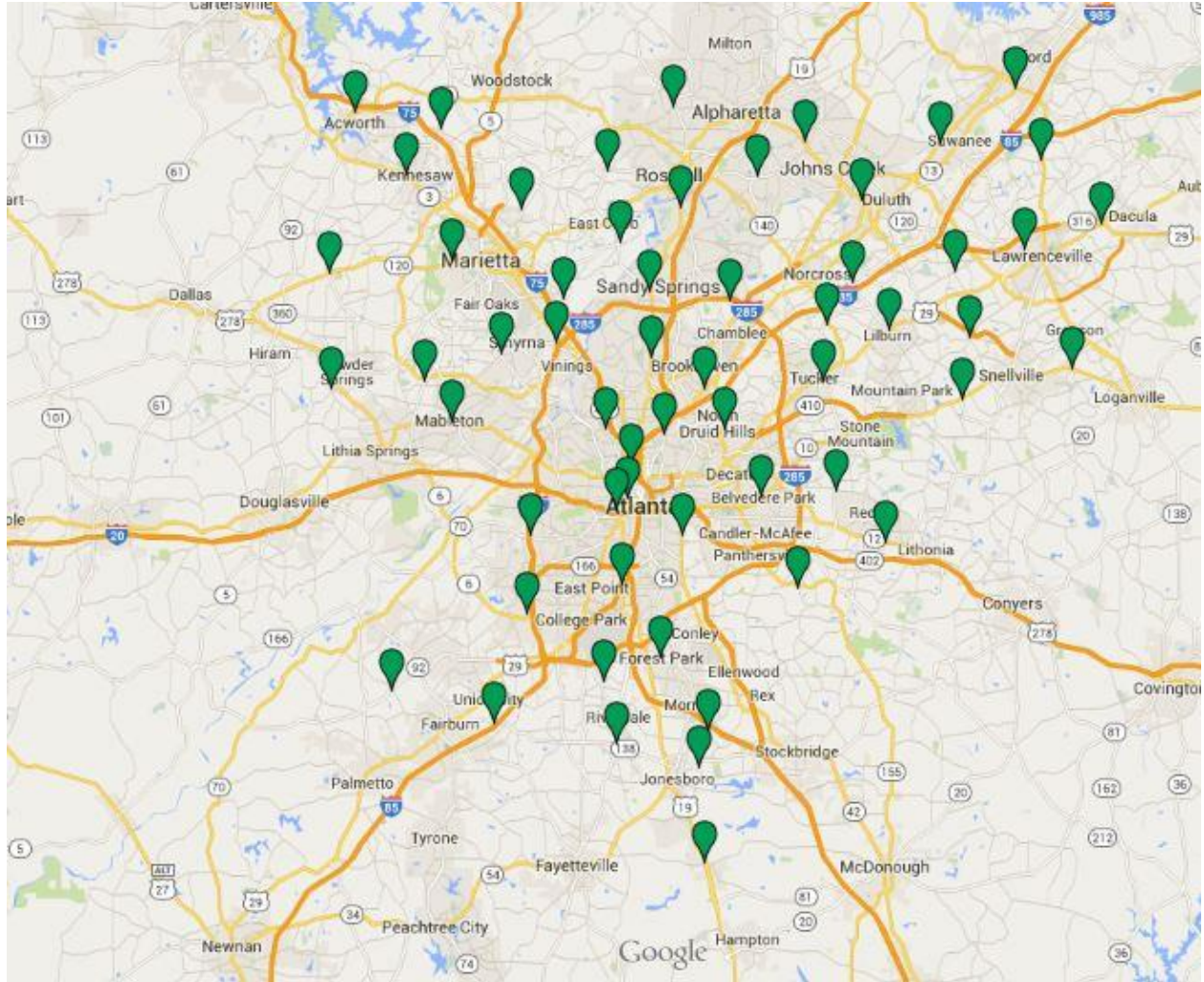
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Fast Food Restaurants – McDonald's



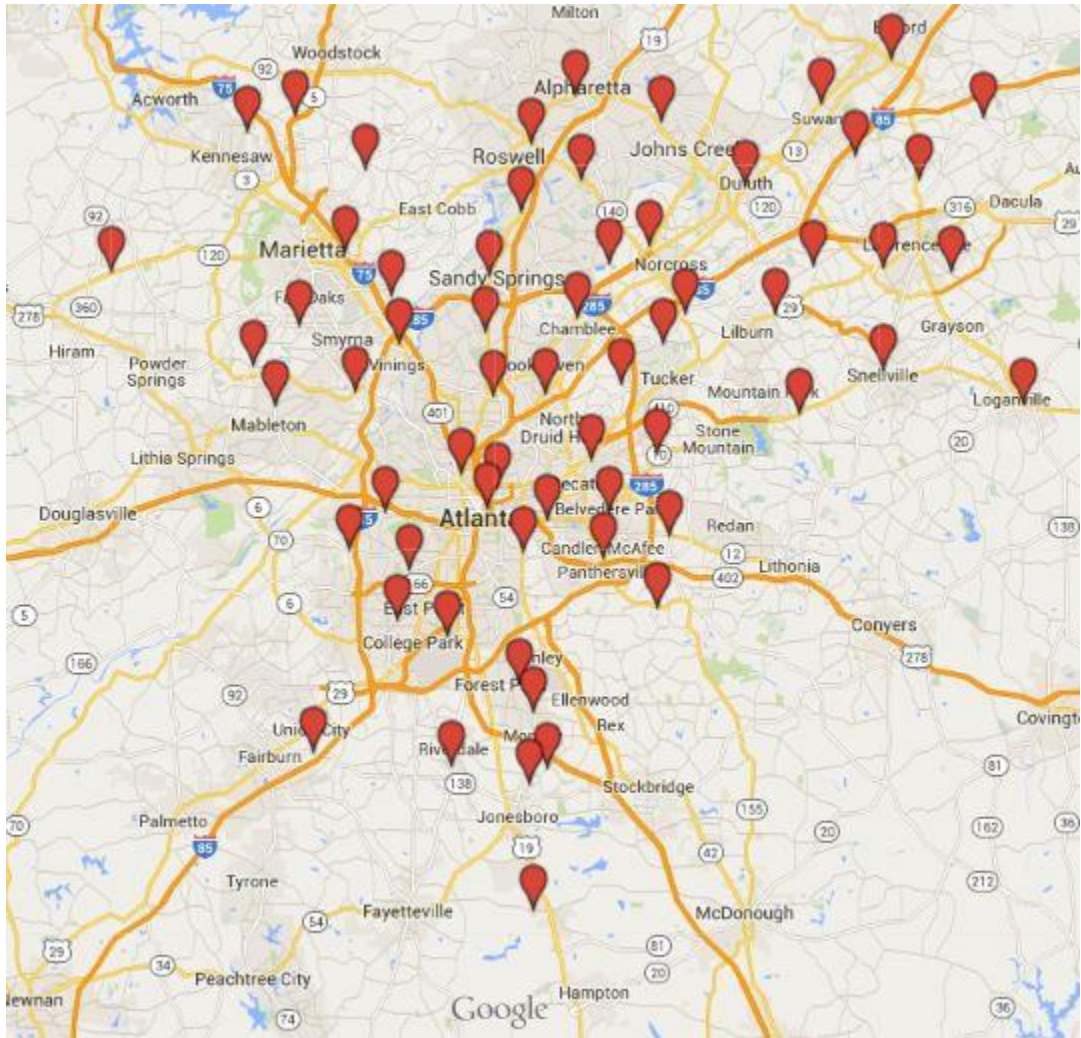
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Fast Food Restaurants – Papa John's Pizza



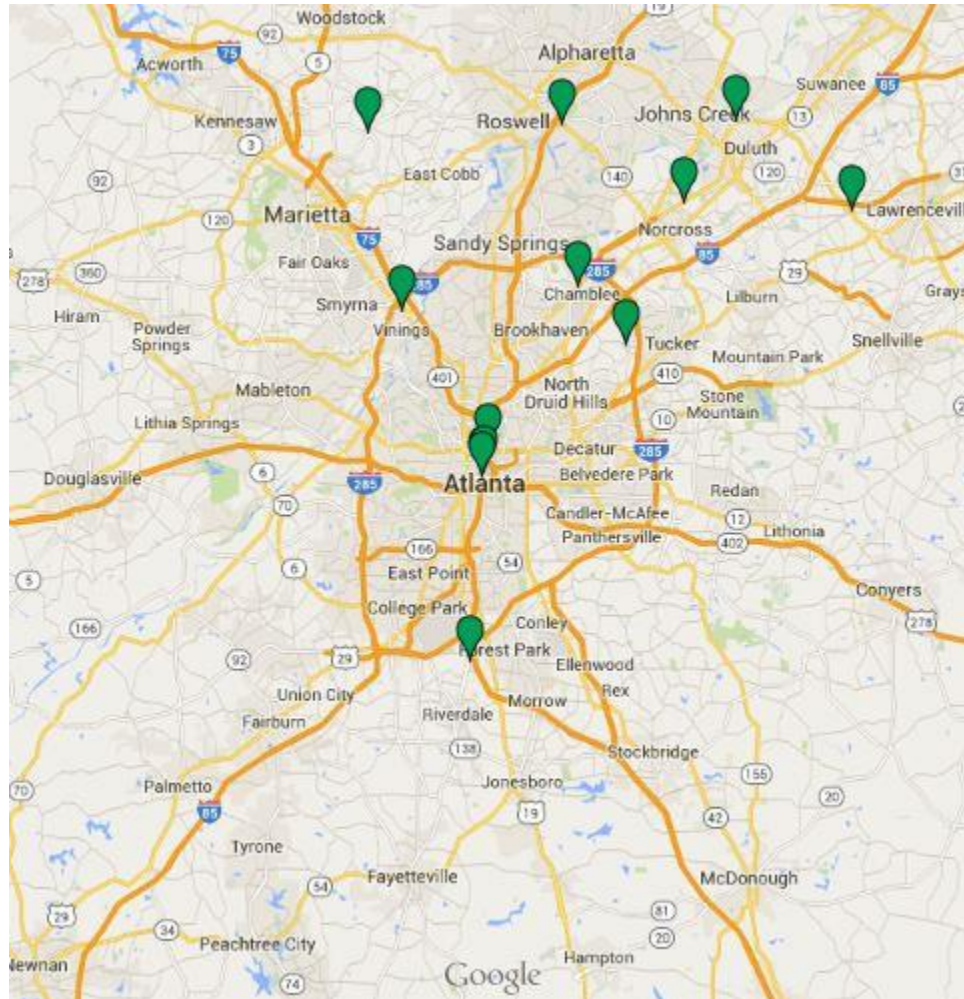
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Fast Food Restaurants – Pizza Hut



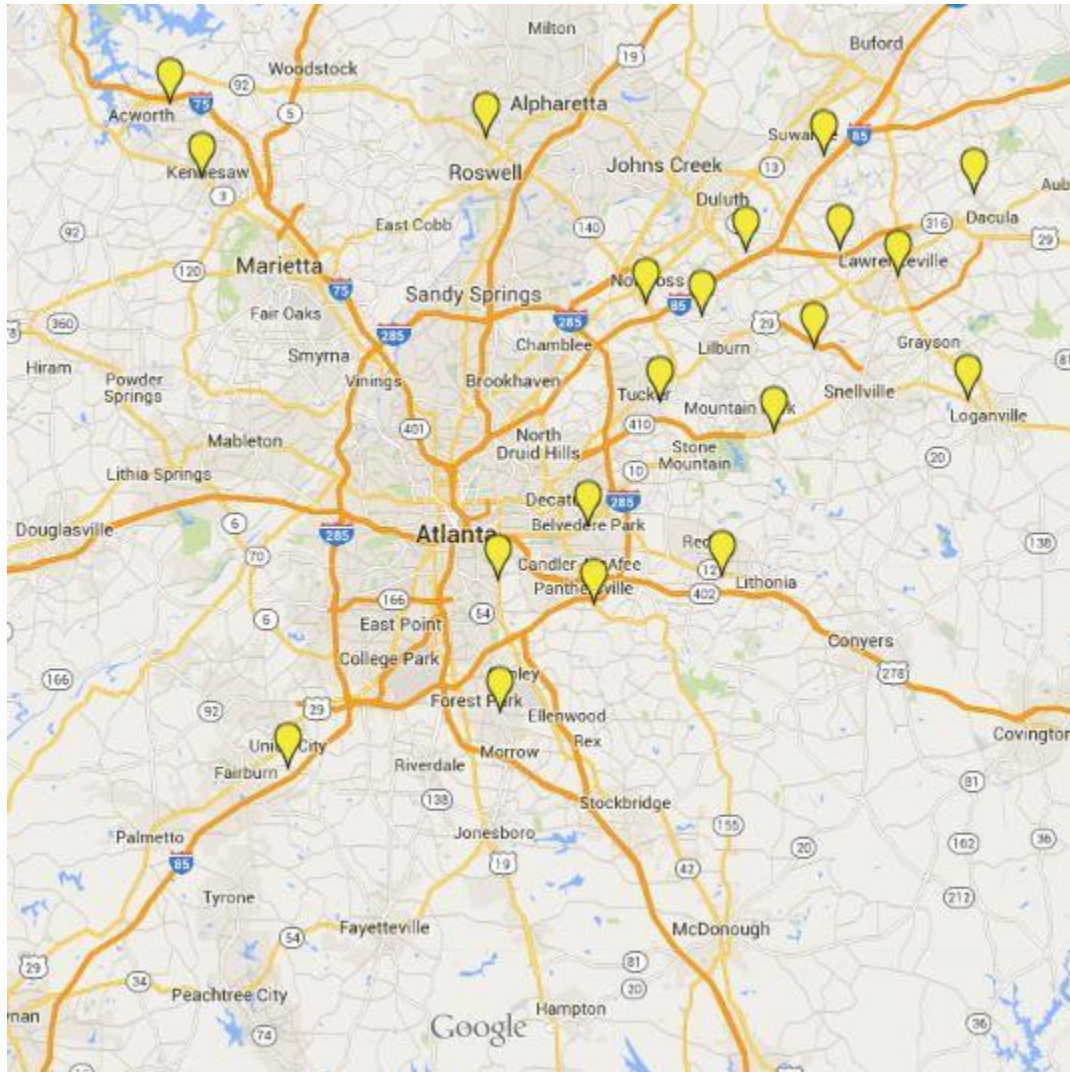
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Fast Food Restaurants – Quiznos



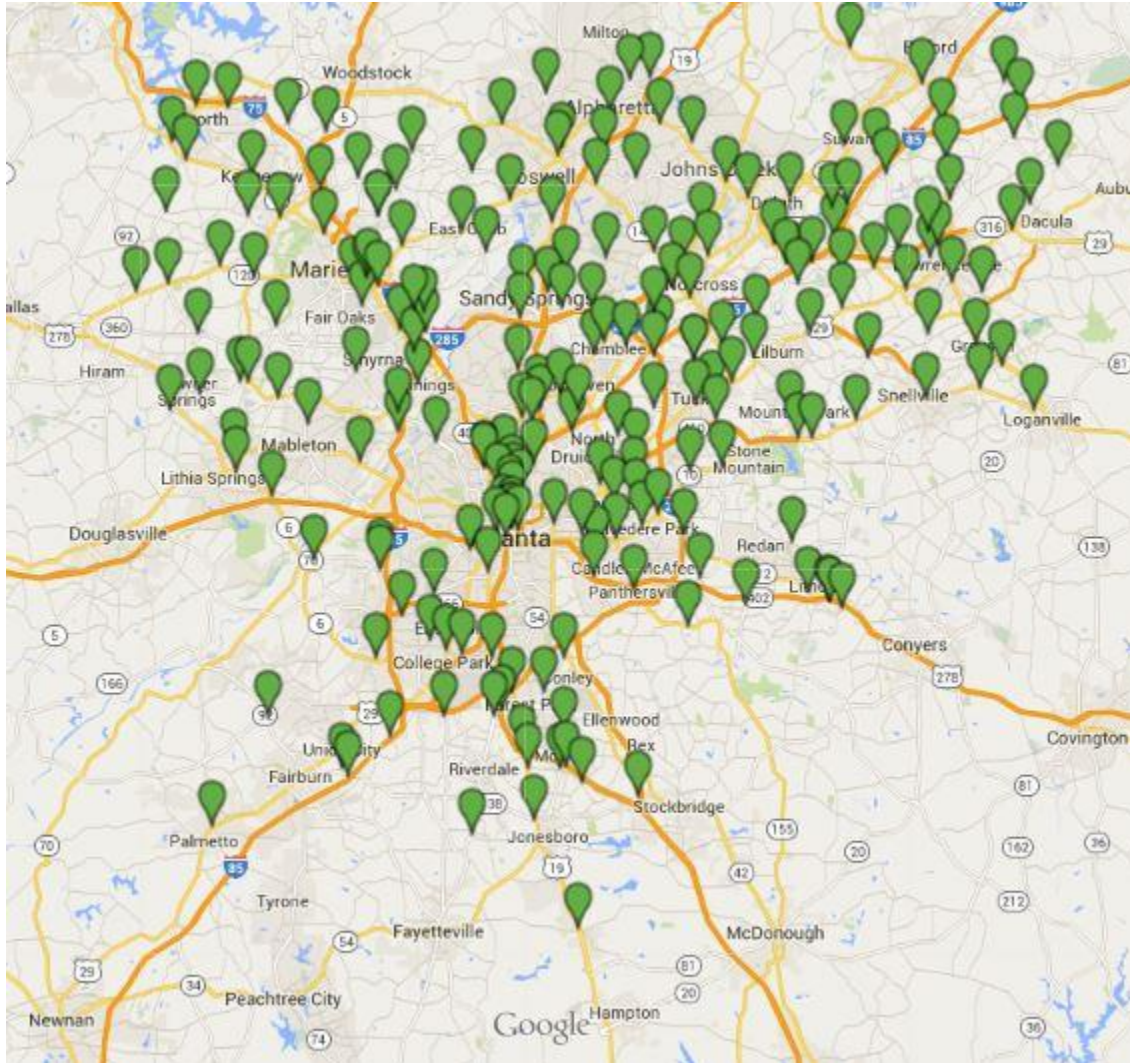
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Fast Food Restaurants – Sonic Drive-In



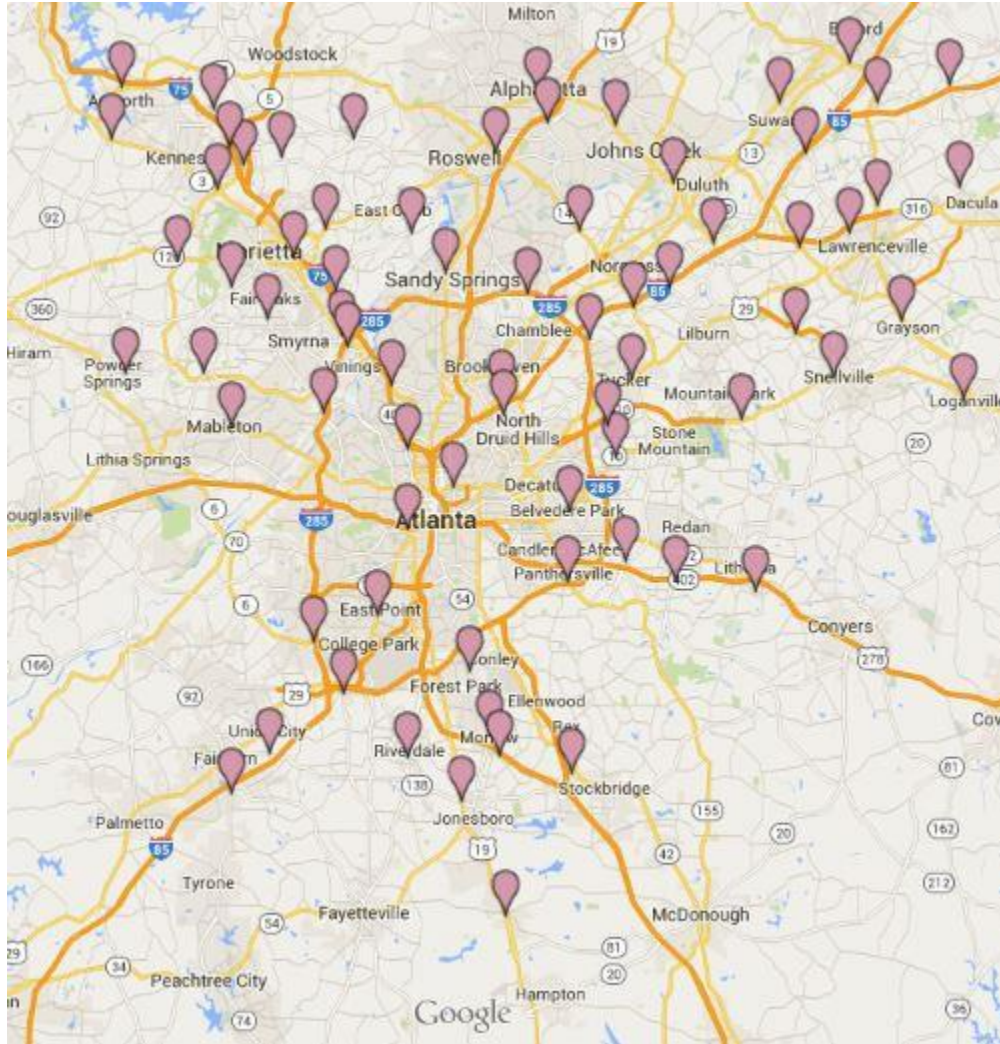
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Fast Food Restaurants – Subway



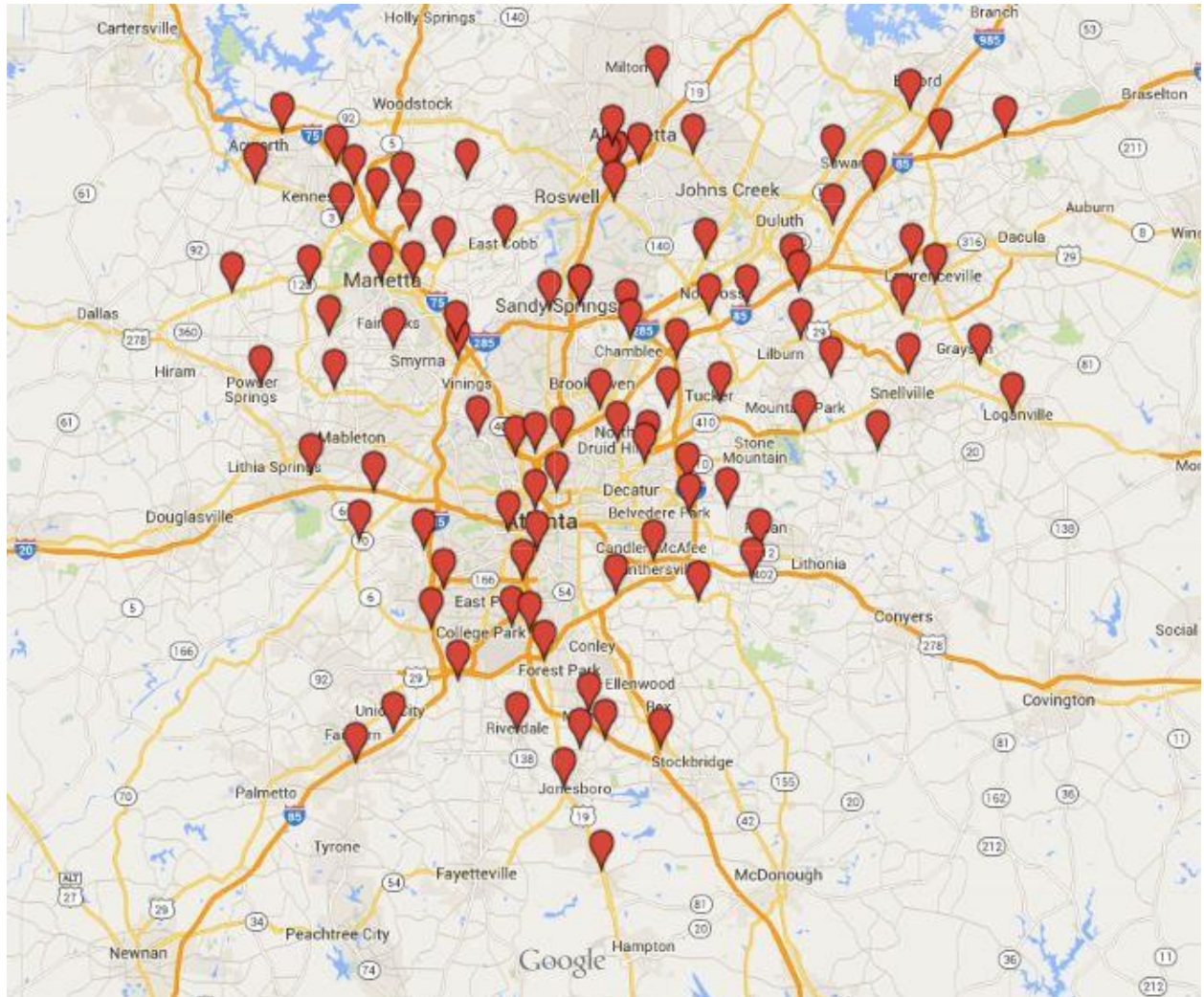
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Fast Food Restaurants – Taco Bell



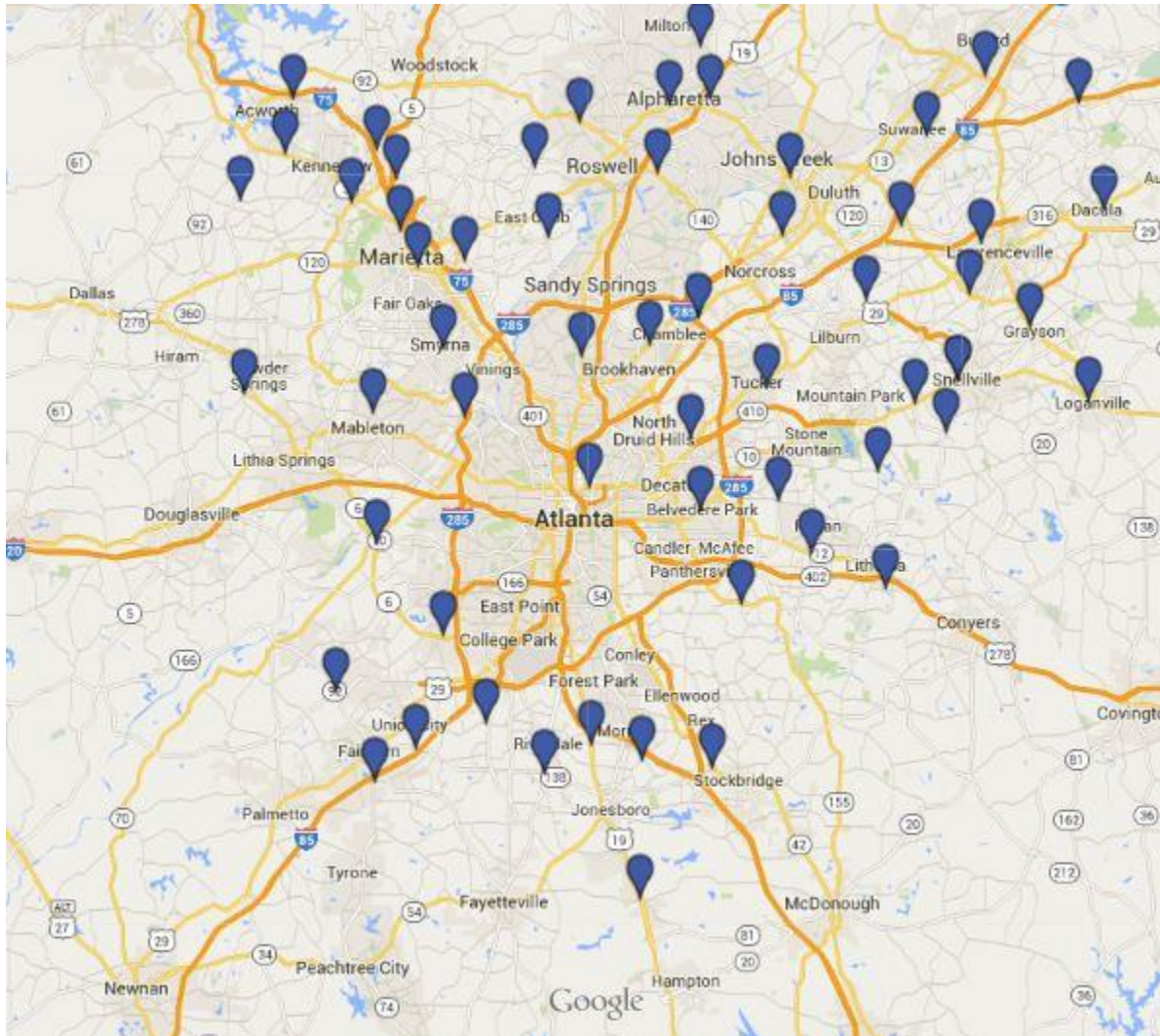
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Fast Food Restaurants – Wendy's



Map URL: https://www.google.com/maps/d/edit?mid=ze6GBaFDEFsk.kT_81i3xwgrc

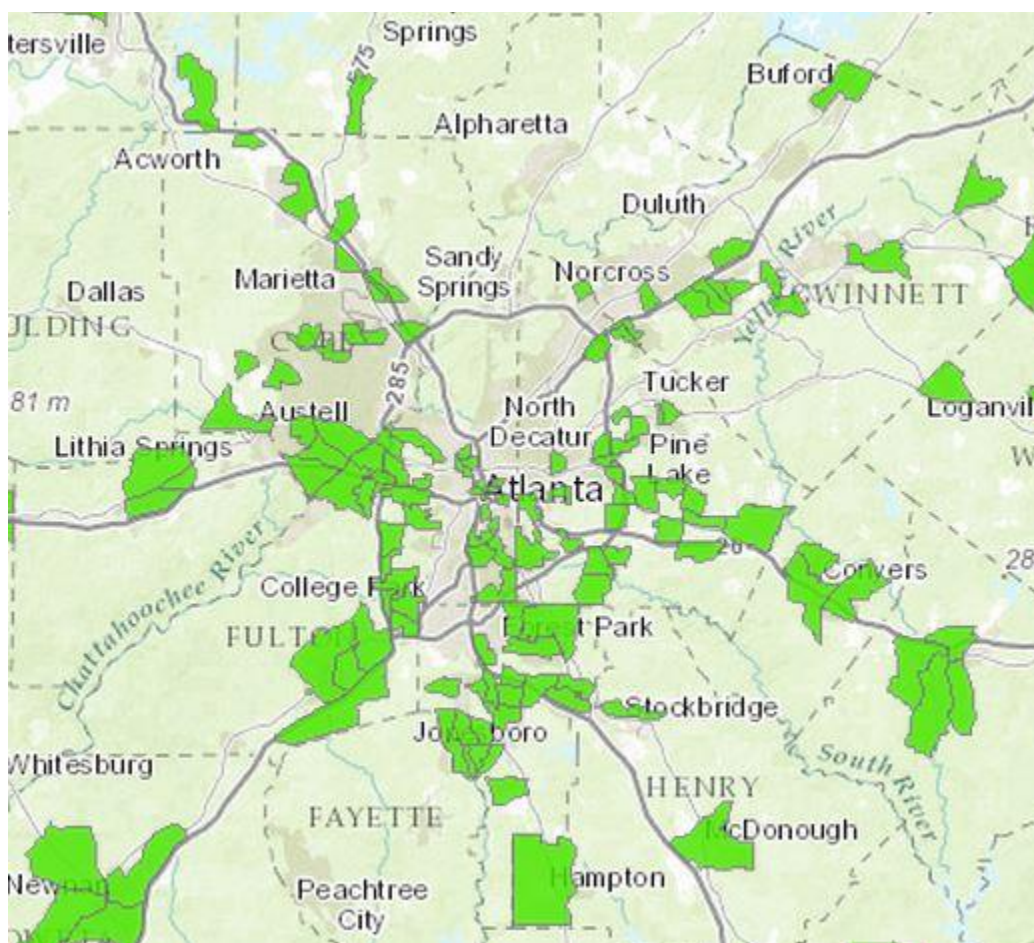
Fast Food Restaurants – Zaxby's



Map URL: <https://www.google.com/maps/d/edit?mid=zYvuaF8C7ZOE.kI3A-iGdSimQ>

USDA FOOD DESERT MAP

This is a map from the United States' Department of Agriculture's governmental website. The map contains interactive components that detail tract information for each of the individual 115 food deserts located within the five counties.



Map URL: <http://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx>